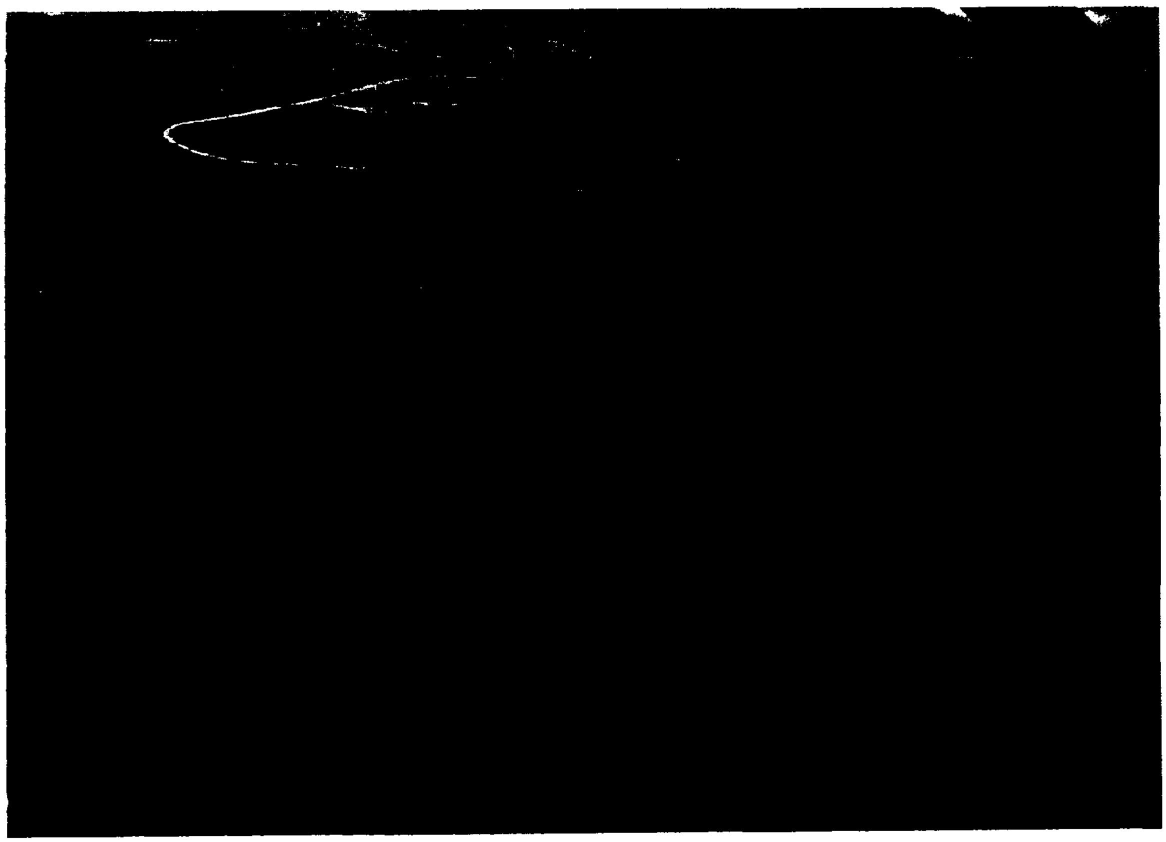
CDM

Libby Asbestos Site, Operable Unit 4
Libby, Montana

Final Sampling and Analysis Plan
Remedial Investigation
Contaminant Screening Study

April 2002



Sampling and Analysis Plan

Response Action Contract for Remedial, Enforcement Oversight, and Non-Time Critical Removal Activities at Sites of Release or Threatened Release of Hazardous Substances in EPA Region VIII

U.S. EPA Contract No. 68-W5-0022

Final Sampling and Analysis Plan, Remedial Investigation, Contaminant Screening Study, Libby Asbestos Site, Operable Unit 4

April 30, 2002

Work Assignment No.: 116-RIRI-08BC
Document Control No.: 3282-116-PP-SAMP-14545

Prepared for:
U.S. Environmental Protection Agency
Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202

Prepared by:
CDM
1331 17th Street, Suite 1050
Denver, Colorado 80202

Response Action Contract
for Remedial, Enforcement Oversight, and Non-Time
Critical Removal Activities at Sites of Release or
Threatened Release of Hazardous Substances
in EPA Region VIII

U.S. EPA Contract No. 68-W5-0022

Final Sampling and Analysis Plan,
Remedial Investigation, Contaminant Screening Study,
Libby Asbestos Site, Operable Unit 4

Work Assignment No.: 116-RIRI-08BC

FSP Prepared by: ______________________ Date: 5/8/02
For Thomas E. Cook
CDM Project Scientist

QAPP Prepared by: ______________________ Date: 5/8/02
For Dee A. Warren
CDM Project Scientist

Reviewed by: ______________________ Date: 5/8/02
For David Schroeder, P.G.
CDM Onsite Manager

Reviewed by: ______________________ Date: 5/8/02
for RoseMary Gustin
RAC VIII QA Manager

Approved by: ______________________ Date: 5/7/02
For Jim Christiansen
EPA Region VIII Remedial Project Manager

DISTRIBUTION LIST

Jim Christiansen (10 copies)
EPA Remedial Project Manager
EPA Region VIII, Denver CO

Linda Newstrom (5 copies)
EPA Information Center
501 Mineral Avenue
Libby, MT 59923

Wendy Thomi (1 copy)
EPA Community Involvement Coordinator
EPA Region VIII, Helena, MT

Craig French (1 copy)
Montana Department of Environmental Quality
Helena, MT

John McGuiggin (1 copy)
Volpe Center Project Manager
Volpe Center, Cambridge, MA

Brian Stewart (1 copy)
Pacific Environmental Services (PES) Project Manager
PES, Herdon, VA

Tim Wall (1 copy)
CDM Libby Project Manager
CDM Cambridge, MA

David Schroeder (26 copies)
CDM Field Office
CDM Libby, MT

Jeff Montera (3 copies)
CDM Remedial Project Manager
CDM Denver, CO

CDM Project File
CDM Denver, CO

Contents

Tables

Figures

Section 1
Introduction

This document serves as the sampling and analysis plan (SAP) for the contaminant screening study (CSS) as part of the remedial investigation (RI) activities for the Libby Asbestos Site Operable Unit 4 (OU) under the Response Action Contract (RAC). This SAP outlines the support that CDM Federal Programs Corporation (CDM) will provide to the U.S. Environmental Protection Agency (EPA) under Work Assignment 116-RIRI-08BC. CDM will conduct the sampling detailed in this SAP through EPA's interagency agreement with the John A. Volpe National Transportation Systems Center (Volpe Center).

This section provides a general explanation of purpose of the CSS and background information related to the initiation of the CSS and project organization. An expanded site background is provided in Section 2.

Previous sampling investigations at the Libby Asbestos Site include the Phase I and Phase II sampling efforts. The Phase I sampling program, initiated in early 2000, was designed as a rapid pilot-scale investigation to obtain information on airborne asbestos levels in Libby in order to judge whether a time-critical intervention was needed to protect public health; obtain data on asbestos levels in potential source materials; and identify the most appropriate analytical methods to screen and quantify asbestos in source materials. Phase I sampling activities are ongoing, and the Phase I quality assurance project plan (QAPP) (EPA 2000a) will be the guidance document for the collection of samples not specific to the CSS, ongoing removal actions, or the Phase II investigation.

Results of initial Phase I sampling prompted removal actions at various sites in and around Libby: the screening and export plants, the Flyway, KDC Bluffs, Plummer Elementary, Libby High School, Libby Middle School, and several residential and commercial properties. Removal actions continue at the screening and export plants, as well as various residential and commercial properties. These removal actions are designed to remove major sources of Libby amphibole (LA) in and around the city of Libby. The major concern with LA is the content of asbestos.

The Phase II sampling investigation began in March 2001 and was designed to collect systematic data on asbestos levels in air and other media in Libby to allow a reliable evaluation of current human exposure and health risk from asbestos, as well as an identification of sources of unacceptable levels of asbestos in air. A summary of the findings (EPA 2001a) of the Phase I and II studies are presented below:

- Asbestos occurs in ore and processed vermiculite obtained from the mine site located outside the city of Libby.

- Asbestos fibers of the type that occur in vermiculite ore from the mine site are hazardous to humans when inhaled.

- Asbestos material fibers that are characteristic of those that occur in materials from the Libby mine are present in a variety of different source materials at residential and commercial locations in and around the community of Libby. Outdoor source materials include yard soil, garden soil, driveway material, and assorted mine waste materials while indoor source materials include dust and Libby vermiculite attic insulation.

- Disturbance of asbestos-contaminated source materials can result in exposure to respirable asbestos fibers in air.

- The concentrations of fibers in air generated by disturbance of source materials may exceed the Occupational Safety and Health Administrations (OSHA) standards for acceptable occupational exposures, and estimated excess cancer risks can exceed EPA's typical risk range by an order of magnitude or more.

The results of the Phase I and II investigations show that LA source materials, when disturbed, release significant amounts of respirable LA (EPA 2001a). LA sources may include primary sources such as Libby vermiculite attic insulation, vermiculite products and waste, soils contaminated with greater than 1 percent LA, or secondary sources such as soil or dust that are contaminated with LA.

LA-containing vermiculite products have been used randomly at unknown properties in the past, and, as a result, EPA has determined that each property in the Libby Valley requires screening for potential sources of LA. However, as a result of the size of the site and the number of properties that need to be evaluated, emphasis needed to be placed on an approach that minimized sampling and analysis to identify areas requiring remediation. In addition, quantitative rules for identifying all sources of potential concern are not yet developed, and depend on further development of analytical methods and a site-specific risk assessment. Therefore, the CSS was designed to use a combination of visual inspections, verbal interviews, and outdoor soil sampling to screen for the presence or absence of potential sources of LA in areas where exposure is most likely to occur.

This SAP is comprised of a field sampling plan (FSP) and a QAPP specific to the CSS. The purpose of this FSP is to provide guidance to ensure that all environmentally related data collection procedures and measurements are scientifically sound and of known, acceptable, and documented quality and that they are conducted in accordance with the requirements of the project. The following sections and appendices are included in this SAP:

Section 1	Introduction
Section 2	Site Background
Section 3	Data Quality Objectives (DQOs)
Section 4	Sampling Program, Rationale, and Locations
Section 5	Field Activity Methods and Procedures
Section 6	Laboratory Analysis and Procedures

Section 7	Quality Assurance (QA)/Quality Control (QC) Program
Section 8	References
Appendix A	SRC Tech Memos
Appendix B	Site Health and Safety Plan (HASP)
Appendix C	CDM Technical Standard Operating Procedures (SOPs) and Site-Specific Guidance Documents
Appendix D	Record of Deviation/Request for Modification Form
Appendix E	Volpe Center Paper Work Flow Process
Appendix F	Laboratory Training Outline

1.1 Objectives

The primary objective of this investigation is to determine the presence or absence of potential LA sources at each property within the study area. There are several secondary objectives including:

- Identification of properties that will likely require remediation (i.e., contain primary sources)
- Identification of properties that will require further investigation (i.e., contain or have indicators of secondary sources)
- Quantification of relative LA abundance in soils
- Identification of characteristics of properties that may increases chances of exposure to LA
- Identification of characteristics of properties that may aid in development of remedial decisions
- Determination of spatial trends

The CSS results will support future risk-based investigation and cleanup decisions on a property-by-property basis.

1.2 Project Schedule and Deliverables

Fieldwork to initiate the CSS is expected to begin on or about May 12, 2002 and continue until October 2002. See the project work plan (CDM 2002) for the schedule of additional deliverables. Resulting project deliverables will include a section regarding adherence to this SAP, any deviations that occurred, and any resulting corrective action taken.

1.3 Project Organization

EPA, Volpe Center, and CDM organization and responsibilities specific to this investigation are discussed in this section. The project organization chart is presented in Figure 1-1.

1.3.1 EPA Project Management

The EPA remedial project manager (RPM), Mr. Jim Christiansen, is CDM's primary contact for coordinating work at the Libby Asbestos Site. Mr. Christiansen is responsible for:

- Defining the scope of the CSS
- Defining data quality objectives
- Selecting CSS team and contractors
- Reviewing all project deliverables
- Maintaining communications with the CDM project manager for updates on the status of the CSS activities
- Reviewing monthly status reports
- Providing oversight of the CSS
- Ensuring that plans are implemented according to schedule
- Reviewing work progress for each task to ensure that budgets and schedules are met
- Reviewing and analyzing overall performance with respect to goals and objectives
- Reviewing analytical results
- Using data collected during the CSS for remediation decision-making

The EPA community involvement coordinator (CIC) for the Libby Asbestos Site is Wendy Thomi. Ms. Thomi, as the CIC, is responsible for :

- Organizing community advisory group (CAG) meetings
- Developing publications in the local newspaper
- Organizing public meetings
- Developing FAQ (frequently asked questions) sheets for public distribution

1.3.2 Volpe Center Management

The Volpe Center management team will be comprised of the following positions: project manager, onsite representative, and the database manager.

The Volpe Center project manager for the Libby Asbestos Site is John McGuiggin. Mr. McGuiggin, as the Volpe Center project manager, is responsible for the management and coordination of the following activities:

- Overall management of the Libby Asbestos Project
- Maintaining communication with EPA and CDM project managers
- Coordinating with CDM to ensure EPA needs are being met
- Tracking of overall budget

The onsite representative for the Volpe Center is Courtney Zamora. Ms. Zamora, as the onsite Volpe Center representative, is responsible for the following:

- Daily communication with EPA and Volpe Center project manger
- Oversight of all site activities
- Coordination with CDM to ensure EPA needs are being met

The database manager for the Volpe Center is Patricia Carnes. Ms. Carnes, as the database manager, is responsible for the following:

- Management of the Libby project database
- Communication with CDM sample coordinator regarding errors on field forms
- Communication with CDM laboratory coordinator regarding laboratory deliverables

1.3.3 CDM Project Management

The CDM management team will be comprised of the following positions: project manager, RAC project manager, onsite manager, health and safety coordinator, field health and safety coordinator, sample coordinator, laboratory coordinator, CSS task leader, project QA Manager (QAM)/QA Coordinator (QAC), and sampling team leaders. Section 4 details the CSS study process and each person's responsibility throughout the process.

The CDM project manager for overall work at the Libby Asbestos Site is Tim Wall. Mr. Wall, as project manager, is responsible for the overall management and coordination of the following activities:

- Maintaining communication with the Volpe Center regarding the overall status of the Libby Asbestos Project
- Preparing status reports for the Volpe Center
- Supervising production and review of deliverables for the Volpe Center
- Overseeing CSS activities as implemented through the Volpe Center
- Tracking overall budgets and schedules
- If applicable, notifying the responsible QA staff immediately of significant problems affecting the quality of data or the ability to meet project objectives
- Procuring laboratory subcontracts

The CDM remedial project manager is Jeff Montera. Mr. Montera, as the remedial project manager, is responsible for the management and coordination of the following activities as associated with the remedial project:

- Maintaining communication with EPA Region VIII regarding the status of the CSS
- Preparing status reports for EPA Region VIII
- Supervising production and review of deliverables for EPA Region VIII
- Tracking EPA Region VIII RAC budgets and schedules
- If applicable, notifying the responsible QA staff immediately of significant problems affecting the quality of data or the ability to meet project objectives
- Incorporating and informing EPA and the Volpe Center of changes in the work plan, SAP, HASP, QAPP, and/or other project documents associated with the CSS

The CDM onsite manger is David Schroeder. Mr. Schroeder, as the onsite manager, is responsible for the management and coordination of the following activities:

- Maintaining communication with Mr. Wall, Mr. Montera, and the onsite representative from the Volpe Center concerning the daily activities of the CSS
- Coordinating daily work activities
- Scheduling personnel and material resources needed to complete the CSS
- If necessary, identifying problems and resolving difficulties in consultation with EPA, Volpe Center, and CDM staff

- Ensuring field aspects of the investigation, including this QAPP, SAP, and other project documents, are implemented by the CSS task leader
- Organizing and conducting daily meetings with onsite personnel
- Implementing and documenting corrective action procedures at the team level
- Providing communication between the sampling team and project management
- Preparing daily reports regarding field activities for the onsite Volpe Center representative

The CDM health and safety coordinator for the Libby Asbestos Site is responsible for the following:

- Ensuring all work will be conducted in accordance with the site-specific HASP that governs the fieldwork outlined in this SAP
- Updating the HASP and ensuring the field health and safety officer is informed of the changes

The CDM field health and safety officer for the Libby Asbestos Site is responsible for the following:

- Ensuring that the protocols specified in the HASP are carried out during field activities
- Ensuring that copies of the HASP and CDM health and safety manual are maintained at the site at all times
- Based on existing site conditions, upgrading or downgrading levels of protection in accordance with the HASP
- Conducting an initial health and safety meeting for all personnel
- Providing an overview of the HASP to all assigned field personnel and having them sign a form to indicate they understand the content of the HASP document and will adhere to its specifications
- Contacting the health and safety coordinator if any questions or issues arise during field activities

The CDM sample coordinator for the Libby Asbestos Site is responsible for the following:

- Maintaining all field paper work

- Informing the laboratory and the laboratory coordinator of the number of samples shipped to the laboratory
- Shipping samples to the laboratory
- Ensuring all samples are maintained within proper chain-of-custody (COC) requirements
- Coordinating data entry requirements related to field forms
- Providing data results to EPA via data requests
- Ensuring all paper work is received by the appropriate CDM office for document control files, as described in Section 5

The CDM laboratory coordinator for the Libby Asbestos Site is responsible for the following:

- Ensuring sample load can be meet by subcontracted laboratories
- Tracking samples through the analysis process to ensure all results are returned within the appropriate turn around time
- Determining scanning electron microscopy/inferred spectroscopy (SEM/IR) split samples from IR results and ensuring IR samples are sent for SEM analysis based on the frequency discussed in Table 7-2
- Ensuring all original data packages are sent to the CDM Helena, Montana office for filing and a copy of each data package related to the CSS is sent to the CDM office in Denver, Colorado

The CDM QAM/QAC for the Libby Asbestos Site is responsible for the following:

- Monitoring all QA/QC activities of the project (as described in Section 7)
- Identifying QA areas that need changes or improvements
- Verifying that corrective actions resulting from staff observations, QA/QC surveillances, and/or QA audits are documented and implemented
- Communicating directly with the CDM project manager and site manager regarding daily QA/QC issues.

The CDM CSS task leader for the Libby Asbestos Site is responsible for the following:

- Ensuring that all sample team members are trained in proper sample collection and field documentation as described in this SAP

- Coordinating with community relations personnel to ensure that access agreements are completed prior to sampling of a property
- Maintaining proper supplies necessary for each sampling team
- Performing QC checks of field team documentation and a 2 percent check of field observations and completing required documentation of the QC checks
- Coordinating with the onsite manager regarding the daily activities of the CSS
- Implementing field aspects of the investigation, including this QAPP, SAP, and other project documents
- Conducting orientation training for all field team members

The CDM team leader for each sampling group is responsible for the following:

- Ensuring that sampling is conducted in accordance with pertinent CDM SOPs and that the quantity and location of the samples meet the requirements of this SAP
- Maintaining proper chain-of-custody forms and sample labels for proper transfer of the samples to the sample coordinator
- Properly completing all field paper work as specified in CDM site-specific SOPs

1.3.4 CDM Quality Assurance Organization

CDM's QA manager, Ms. RoseMary Gustin, implements the QA program. The QA manager is independent of the technical staff and reports directly to the president of CDM on QA matters. The QA manager, thus, has the authority to objectively review projects and identify problems and the authority to use corporate resources as necessary to resolve any quality-related problems.

The QA coordinator for this project, Ms. Krista Lippoldt, and the regional QA specialist, Mr. George DeLullo, report to the QA manager on QA matters. Under the oversight of the QA manager, they are responsible for the following:

- Reviewing and approving the project-specific plans
- Directing the overall project QA program
- Reviewing QA sections in project reports, as applicable
- Reviewing QA/QC procedures applicable to this project
- Auditing selected activities of this project performed by CDM and subcontractors, as necessary
- Initiating, reviewing, and following up on response actions, as necessary

- Maintaining awareness of active projects and their QA/QC needs
- Consulting with the CDM QA manager, as needed, on appropriate QA/QC measures and corrective actions
- Conducting internal system audits to check on the use of appropriate QA/QC measures, if applicable
- Arranging performance audits of measurement activities, as necessary
- Providing monthly written reports on QA/QC activity to the CDM QA manger

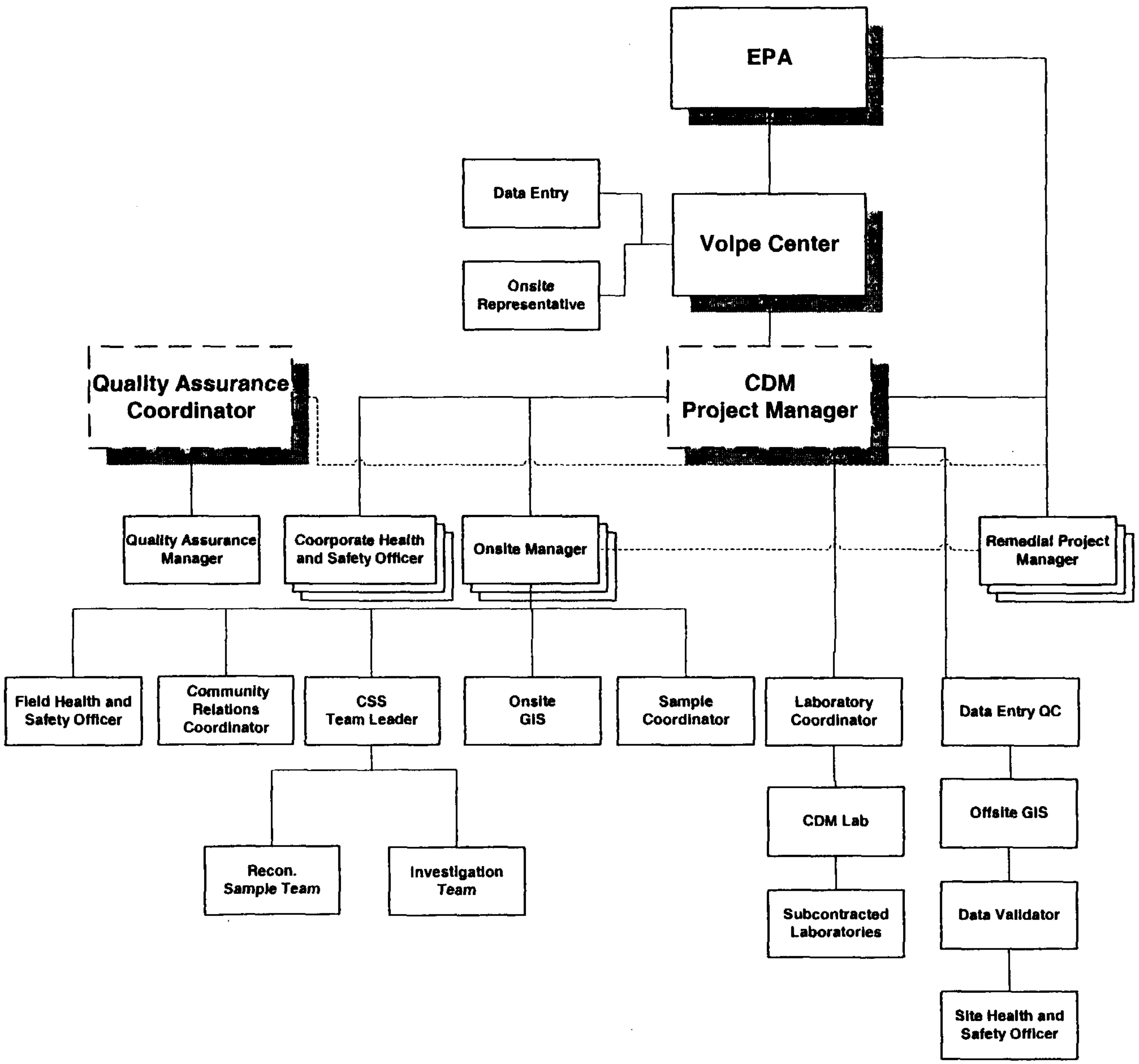
In addition to the CSS team (i.e., EPA, Volpe Center, and CDM), the following organizations have provided input in the form of discussions and written comments on the development of the CSS SAP:

- U.S. Geological Survey (USGS)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- U.S. Public Health Service
- Montana Department of Environmental Quality (MDEQ)

In addition, several community involvement measures organized have been or will be taken to provide information to the Libby community regarding the CSS. The measures will include:

- CAG meetings
- Publications in the local newspaper
- Public meeting
- A publicly distributed FAQ sheet describing the sampling event

Figure 1-1: CSS Project Management Organization Chart



Section 2
Site Background
2.1 Site Location

The Libby Asbestos Site is located within Sections 3 and 10, T30N, R31W of the Libby Quadrangle in Lincoln County, Montana (Figure 2-1). It includes a vermiculite mine; two former vermiculite processing centers, the former screening plant and the former export plant; the road between the former screening plant and the mine site (Rainy Creek Road); and homes and other businesses, which may have become contaminated with asbestos fibers as a result of the vermiculite mining and processing conducted in and around the city of Libby (Figure 2-2).

2.2 Site History

Vermiculite was discovered 7 miles northeast of Libby, Montana in 1881 by gold miners. In the early 1920s, Mr. Edward Alley began initial mining operations on the vermiculite ore body located approximately 7 miles northeast of Libby. Full-scale operations began later that decade under the name of the Universal Zonolite Insulation Company (Zonolite). This ore body contained amphibole asbestos fibers with compositions including tremolite, actinolite, richterite, and winchite (herein referred to as LA) as defined by B.E. Leake, et al. (1997). Unlike, the commercially exploited chrysotile asbestos, the Libby amphibole material has never been used commercially on a wide scale, and, for the mine's operating life, it was considered a byproduct of little or no value. The commercially exploited vermiculite was used in a variety of products, including insulation and construction materials, as a carrier for fertilizer and other agricultural chemicals, and as a soil conditioner.

The vermiculite ore was mined using standard strip mining techniques and conventional mining equipment. The ore was then processed in an onsite dry mill to remove waste rock and overburden material. Once "cleaned", the processed ore was transported down from the mine to the former screening plant, which sorted the ore into five size ranges. After the sorting process, the material was shipped to various locations across the United States, for either direct inclusion in products or for "expansion" prior to use in products. Expansion (also known as "exfoliation" or "popping") was accomplished by heating the ore, usually in a dry kiln, to approximately 2000 degrees Fahrenheit (°F). This process explosively vaporizes the water contained within the mica structure causing the vermiculite to expand by a factor of 10 to 15. This produces the vermiculite material most commonly seen in stores and sold as soil conditioner for gardens and greenhouses.

In Libby, operations handling this material occurred at four main locations: the mine and mill located on Rainy Creek Road on top of Zonolite Mountain; the former screening plant and railroad loading station located at the intersection of Highway 37 and Rainy Creek Road and directly across the Kootenai River, respectively; the former expansion/export plant (the former export plant) located immediately west of Highway 37 where it crosses the Kootenai River; and at the former expansion plant located at the end of Lincoln Road, near 5th Street (Figure 2-3). The Lincoln Road

Expansion Plant went off line sometime in the early 1950s. Investigations are underway to determine the exact location of this facility.

All structures at the former screening plant have been demolished, and approximately 90,000 cubic yards of contaminated soils have been removed and placed in the mine. Restoration of the former screening plant is expected to be completed in late 2002. Similarly, all structures except the planer building have been demolished at the former export plant site, and approximately 5,000 cubic yards of contaminated soils have been removed and placed in the mine. Completion of cleanup activities at the former export plant is expected in 2002. Removal activities have not been initiated at the mine or railroad loading station.

In 1963, the W.R. Grace Company (Grace) purchased Zonolite and continued vermiculite-mining operations in a similar fashion. In 1975, a wet milling process was added that operated in tandem with the dry mill until the dry mill was taken off line in 1985. The wet milling process was added to reduce dust generation of the milling process. Expansion operations at the former export plant ceased in Libby sometime prior to 1981 although this area was still used to bag and export milled ore until mining operations were stopped in 1990. Before the mine closed in 1990, Libby produced about 80 percent of the world's supply of vermiculite.

Since 1999, EPA Region VIII's Emergency Response Branch (ERB) has been conducting sampling and cleanup activities to address highly contaminated areas in the Libby Valley. The ERB investigation was initiated in response to media articles, which detailed extensive asbestos-related health problems in the Libby population. While at first the situation was thought limited to those with direct or indirect occupational exposures, it soon became clear that there were multiple exposure pathways and many persons with no link to mining-related activities were affected.

Typically, the amphibole asbestos contamination found in the Libby Valley comes from one or some combination of "primary" sources: vermiculite mining wastes, vermiculite ores, vermiculite processing wastes, bulk residuals from vermiculite processing, "LA-containing rocks," or Libby vermiculite attic insulation. Asbestos from these primary sources has been found in interior building dust samples and local soils, which in turn act as secondary sources. To date, the goal of ERB has been to find and identify areas with elevated levels of asbestos (the primary sources) and to remove them. ERB has conducted contaminated soil removals at the former export plant location, the former screening plant and adjacent properties, and several residential properties with asbestos source materials present. Three schools in the Libby school system have also had removals performed. Details of these operations can be found in the applicable Action Memorandums.

Future work in Libby is proceeding on two fronts. First, ERB continues to remove previously identified primary outdoor source areas and is also considering the removal of Libby vermiculite attic insulation from buildings in the Libby Valley. Second, pursuant to the proposal of the Libby Asbestos Site to the National Priorities

List (NPL) in February 2002, the EPA Superfund Remedial Program has initiated an RI, of which the CSS is the first phase. The CSS will identify additional properties containing primary sources, which require immediate cleanup, as well as identify properties that might require further investigation and/or remediation as final risk assessment and cleanup decisions are made.

For long-term management purposes, the Libby Asbestos Site has been divided into two OUs: Operable Unit 3 (OU3), which represents the former mine and Rainy Creek Road, and Operable Unit 4 (OU4), which represents the remainder of the Libby Valley. This FSP has been prepared to address investigative activities associated with OU4 only. Plans for the work associated with OU3 is expected in the near future.

2.3 Environmental Setting

Mean annual precipitation in Libby is 19.4 inches (in.), with 37 percent occurring between the months of November through January. In addition, 18 percent of the annual precipitation occurs during the months of May and June. The month having the highest average precipitation is January, with 2.42 in. Average ambient temperature in Libby ranges from 22.4°F in January to 67°F in July. Average annual precipitation at the mine site is estimated at 20 in. per year, and the temperature would be expected to average 3 to 5 degrees cooler due to the higher elevation relative to the city of Libby. Climatological data were obtained from the Libby 1 N.E. Ranger Station 5 miles northeast of Libby.

2.4 Contaminant of Concern

The contaminant of concern for this investigation is LA. Asbestos fibers are odorless and tasteless and vary in length, structure, and chemical composition. Fibers are microscopic and environmentally persistent. They do not evaporate, burn or dry out from heat, or erode in water. The toxicity of different types of asbestos fibers varies, but chronic and acute exposure to any one of them potentially can be fatal. While some chrysotile asbestos is likely present in the study are, it is not due to site-related contamination and is not considered a contaminant of concern. The CSS will not screen for chrysotile or other forms of asbestos, only LA. If other contaminants are discovered, the property owner will be properly advised.

The human health risks associated with asbestos fibers released in the environment include:

- Malignant mesothelioma, a cancer of the pleural or peritoneal cavity. In early stages of the disease, cancer is found in the lining of the chest cavity near the lung and heart or in the diaphragm. Mesothelioma may spread to tissue surrounding the lungs or other organs. Virtually all mesothelioma cases are attributable to asbestos exposure.

- Asbestosis, the scarring of the tissue of the lung itself from inhalation of fibers. It ranges in severity from mild impairment to disabling and eventually fatal.

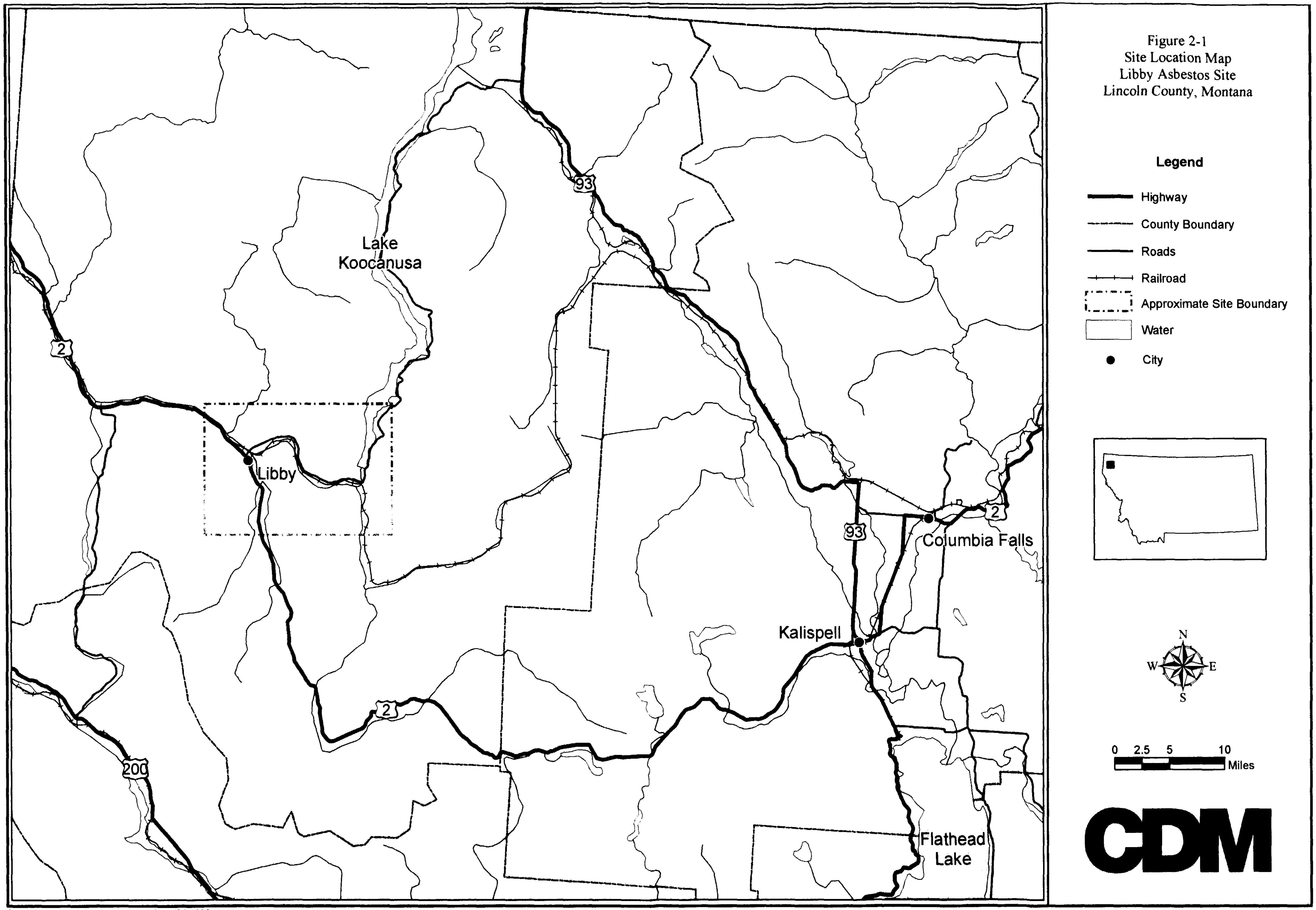
- Lung cancer, any type of malignant tumor that originates in the lung itself. The exact relationship between asbestos exposure and lung cancer is not completely understood.

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Figure 2-1
Site Location Map
Libby Asbestos Site
Lincoln County, Montana

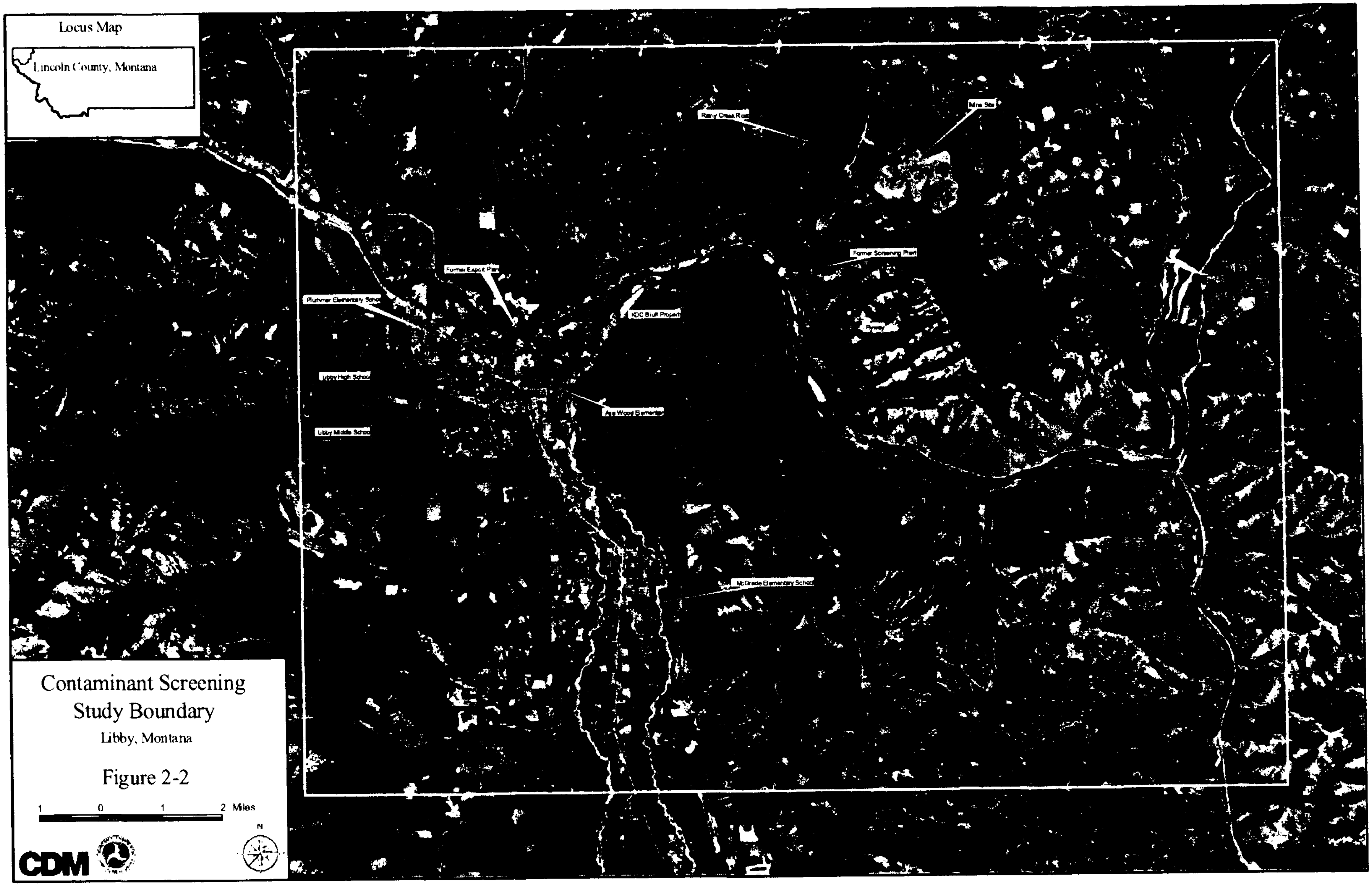


Map Filename: libby_loc_map.mxd 04/24/2002

Poor Quality Source Document

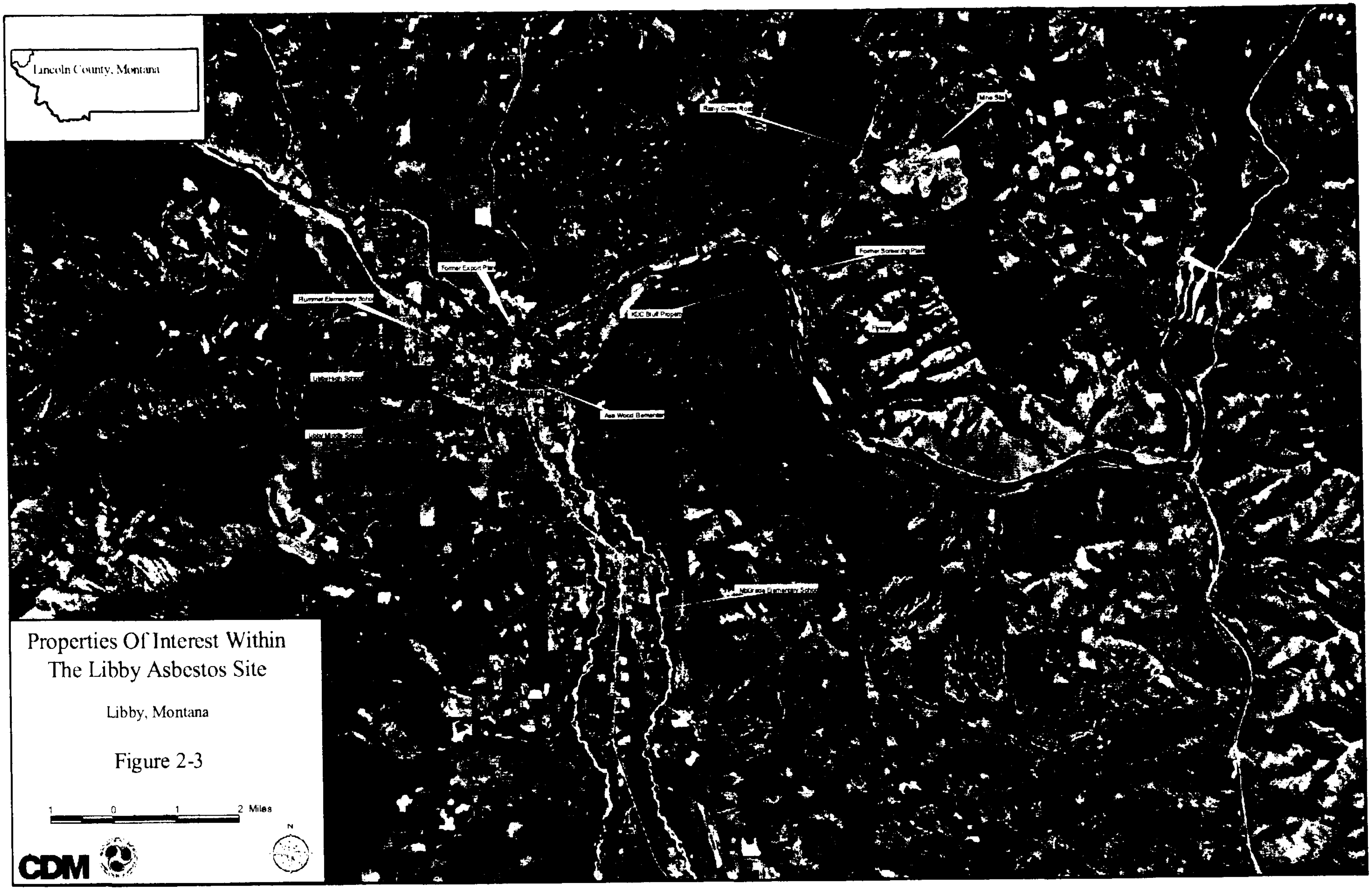
The following document images have been scanned from the best available source copy.

To view the actual hard copy, contact the Superfund Records Center at (303) 312-6473.



Contaminant Screening
Study Boundary
Libby, Montana

Figure 2-2



Properties Of Interest Within The Libby Asbestos Site

Libby, Montana

Figure 2-3

Section 3
Data Quality Objectives

The DQO process is a series of seven planning steps based on the scientific method that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The goal of the DQO process is to help assure that data of sufficient quality are obtained to support remedial response decisions, reduce overall costs of data sampling and analysis activities, and accelerate project planning and implementation. The DQO process related to this CSS is presented below and includes all information as required under the seven-step process.

A vermiculite ore body was discovered 7 miles northeast of Libby, Montana. Mining of this ore body began in the early 1920s and continued until 1990. This ore body contained amphibole asbestos fibers with compositions including tremolite, actinolite, richterite, and winchite as defined by B.E. Leake, et al. (1997) (LA). Vermiculite in processed and unprocessed forms was used throughout the city of Libby as soil amendments, fill material, insulation, and as building materials. Occupational exposure to these asbestiform minerals occurred during the mining, processing, and transportation of the ore. Non-occupational exposures occurred as family members of workers were exposed though "worker take-home", ambient air levels, and from the presence of Libby vermiculite used as soil amendments, fill material, insulation, and in other building materials. Exposure to these asbestos fibers can cause several adverse health effects, including malignant mesothelioma, asbestosis, and lung cancer (ATSDR 2001). The exposure pathways are presented in the site conceptual model (Figure 3-1). Inhalation is the only exposure route of concern for this investigation.

In 1999, EPA was alerted by a newspaper article of an abnormally high incidence of asbestos-related disease in Libby, Montana and, therefore, began an investigation an emergency response in the area (Libby Asbestos Site). To date, EPA has identified sources of LA that present an immediate danger to human health (i.e., hot spots) and have begun removal actions of these sources (EPA 2000d, EPA 2001c). However, at present, EPA does not know locations of other sources of LA at residences and commercial sites that have not been investigated. Because LA-containing vermiculite products have been used randomly at unknown properties in the past, EPA has determined that each property in the study area requires screening for potential sources of LA. A sampling program, which exhaustively measures all potential LA sources and exposures at each property in one step (e.g. extensive indoor dust sampling, transmission electron microscopy [TEM] analysis, and risk-based outdoor sampling), is both unnecessary and cost/time prohibitive. A two-step sampling program, which builds upon past EPA investigations in Libby in order to limit future analytical costs while still making sound decisions, is a more efficient approach. In this regard, the CSS was designed as the first phase of the RI. The CSS is intended to screen all properties in the study area and generally classify them as either:

1. LA is present and it is likely that no further investigation will be necessary to determine that property requires cleanup.

2. LA is or may be present, but additional sampling and investigation is required to determine if cleanup is warranted. The 2nd phase of the RI would address these properties.

3. There is no evidence that LA is present and it is likely that no cleanup or further investigation will be required.

Within that prioritization approach, the primary objective of the CSS is to determine the presence or absence of potential LA sources at each property in the study area. For purposes of this work, potential LA sources are classified into two categories:

- Primary sources, which include Libby vermiculite attic insulation, other visibly identifiable vermiculite products originating from the Libby mine (stockpiles of vermiculite, LA-containing rocks, etc.), and outdoor soils without visible vermiculite that contain greater than or equal to 1 percent LA by weight. The rationale for a 1 percent cutoff is discussed below.

- Secondary sources, which include contaminated indoor dust and outdoor soils without visible vermiculite, that contain less than 1 percent LA by weight. Some indicators for the presence of secondary indoor sources (LA-contaminated dust), are the past presence of Libby vermiculite attic insulation, former or current occupants were persons employed at the mine or a former processing facility, and/or former or current occupants were diagnosed with an asbestos-related disease.

In addition, the information collected during this study will be used for the following:

- Quantification of relative LA abundance in soils

- Identification of characteristics of properties that may increase chances of exposure to LA

- Identification of characteristics of properties that may aid in the development of remedial decisions

- Determination of spatial trends

- Determination of future risk-based investigation and remedial decisions on a property by property basis

The planning team for the CSS includes Jim Christiansen (EPA RPM and decision maker), Mary Goldade (EPA project chemist), John McGuiggin (Volpe Center project manager), Tim Wall (CDM project manager for the Volpe Center), Jeff Montera (CDM project manager for the EPA), David Schroeder (CDM onsite manager), Dee Warren (CDM project scientist), Tommy Cook (CDM project scientist), and Krista Lippoldt (CDM QA coordinator).

The information gathered to answer the primary objective will be collected from residential and commercial properties within the study area (target population). The spatial boundaries of these properties include everything between the top of the tallest structure to 6 inches below the ground surface and within each property boundary. The temporal boundaries include the time frame from when mining activities began at the mine site through the time of visual inspection and/or sampling at a property.

The information for this study will be collected during field activities between May 12 and October 31, 2002. All personnel conducting the fieldwork associated with this CSS will be from CDM as a subcontractor to Volpe. Budget and schedules related to the project are discussed in the work plan (CDM 2002).

In order to meet the primary objective, a screening program using visual inspection, verbal interviews, and analytical results will be implemented. The following explains how each of these will be used.

- Visual inspection will be used to determine the presence or absence of Libby vermiculite attic insulation, primary outdoor sources (other than soil), and/or vermiculite present in building materials. If during visual inspection any of these sources are observed in any amount, they will be assumed to be present at the property. The rationale for considering visible observations of Libby vermiculite products or waste as a definitive indicator of LA content is presented in Appendix A.

- Verbal interviews will be used to identify properties that used Libby vermiculite attic insulation in the past, used vermiculite in building materials, had former or current occupants who were employed in vermiculite mining activities in Libby, and/or had former or current occupants who were diagnosed with an asbestos-related disease. If during a verbal interview, any of these factors is identified, the potential of an LA secondary source will be assumed.

- Analytical results of soil samples will be used to identify outdoor soil sources. If any analytical soil results are above the detection limit, at any level, the soil will be considered a potential LA source. The determination of a primary versus secondary source is explained above.

A range of asbestos analytical techniques was considered for this investigation to identify potential LA in soil, of which two (IR and SEM) were chosen. IR was chosen as the primary analytical technique because it is a cost and time efficient presence/absence method, with a relatively low reporting limit and allows for some degree of quantification (percent weight). SEM was chosen as a secondary method for providing additional confidence in analytical results. SEM is a less efficient presence/absence technique, but is a more established analytical technology and allows some visual description of the fiber morphology.

The action level to determine the presence or absence of potential LA sources in soil is the reporting limit of the IR method (0.1 percent by weight). This action level is not risk based. The SEM method can detect percent asbestos by weight to a lower limit but would require a cost prohibitive amount of time per sample. The action level to differentiate between a primary and secondary source in soil without visible vermiculite present is one percent by weight. The rationale for choosing this concentration is presented below:

- Studies performed during the Phase 2 investigation demonstrate that disturbance of Libby vermiculite products or waste with any level of detectable asbestos (i.e. trace or higher) can release respirable asbestos fibers into the air, which may greatly exceed typical risk guidelines (EPA 2001a). Such releases have been documented even for materials for which bulk measurements of asbestos were non-detect by polarized light microscopy (PLM).

- Because of the potential that these materials may serve as sources for LA, EPA has determined that these materials should be cleaned up (EPA 2000d, EPA 2001c). In this regard, any detection of asbestos in bulk Libby vermiculite materials by PLM (i.e. trace) has been considered sufficient justification for action in Libby to this point.

- The concentration of asbestos in bulk materials that is detectable, but not quantifiable by PLM, (i.e., trace) is estimated to be approximately 0.5 percent by weight (i.e., one half PLM quantitation limit).

- Therefore, to remain strictly consistent with previous EPA actions regarding Libby vermiculite products or waste, concentrations of 0.5 percent or greater in soil could be considered the approximate trigger for action for the CSS and a valid cutoff between a primary and secondary source.

- However, because of the uncertainty of IR values in this range, at the present time only soil with asbestos concentrations greater than 1 percent will spur immediate cleanup decisions (to ensure cleanup decisions are made on a "worst first" basis and to avoid making a needless expenditures). Soils with concentrations less than 1 percent may be investigated further in the future.

For the purposes of the CSS, the detection of LA at any concentration confirms the presence of LA. If the reporting limit changes during the study, the primary objective can still be accomplished because any detection of LA at any concentration confirms the presence of LA. However, if the detection limit changes to greater than 1 percent, the distinction between a primary source and secondary source cannot be made. Although it is known that analytical error exists, for the purposes of this study, any LA result greater than or equal to 1 percent is considered a primary source, and any result less than 1 percent is considered a secondary source (i.e., no gray area or decision error limits have been established).

The practical constraints that may interfere with the collection of accurate and complete information include, but are not limited to: lack of property access, misinformation from property owner/resident, unnoticed or hidden potential LA sources, inclement weather conditions (i.e., snow-covered ground, frozen soils, overcast skies, etc.), and lack of access to attics or wall cavities. Overcast skies reduce the visibility of phyllosilicates (unexpanded vermiculite); snow prevents outdoor visual confirmation; and frozen soils limit composite soil sample homogenization.

Depending on the type (primary or secondary) of potential LA sources, different alternative actions may be applicable. The alternative actions that may occur at a property as a result of information gathered during the study include the following:

- Remediation of interior, which includes removal of Libby vermiculite attic insulation and cleaning
- Remediation of exterior, which includes removal of primary sources
- Further indoor sampling
- Further outdoor sampling
- No further action at this time

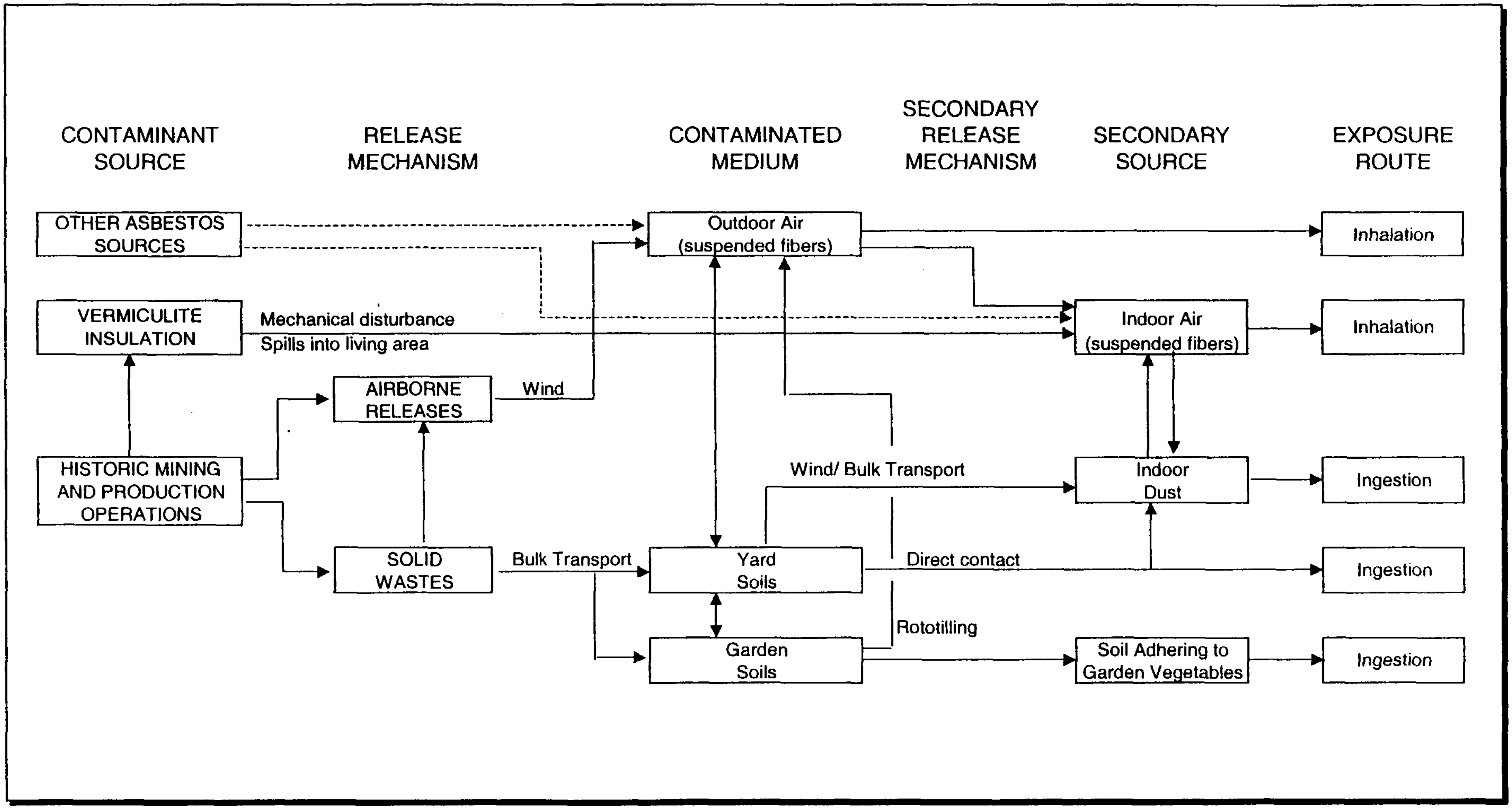
The determination of which decision(s) is appropriate will be made following the decision tree presented in Figure 3-2. These decisions are based on the following rationale:

- Primary sources (i.e., include Libby vermiculite attic insulation and outdoor source materials that are greater than or equal to 1 percent LA by weight) inherently contain high levels of LA (Appendix A).
- The levels of LA in primary sources pose a risk to human health (EPA 2001a).
- The presence of primary sources also indicates that secondary sources (i.e., contaminated indoor dust and outdoor soil source materials that are less than 1 percent LA by weight) may be present.
- Further risk-based investigation is needed to determine if secondary sources pose a risk to human health.
- It is necessary to identify secondary sources at each property in the instance that further risk-based investigation indicates that these sources pose a risk to human health. If it is determined that secondary sources do pose a risk, further action (i.e., remediation) may be taken at properties with secondary sources.

- Properties that do not meet any of these triggers for action will not undergo any remediation at this time. But, these properties might require further investigation and/or remediation as final risk assessment and cleanup decisions are made.

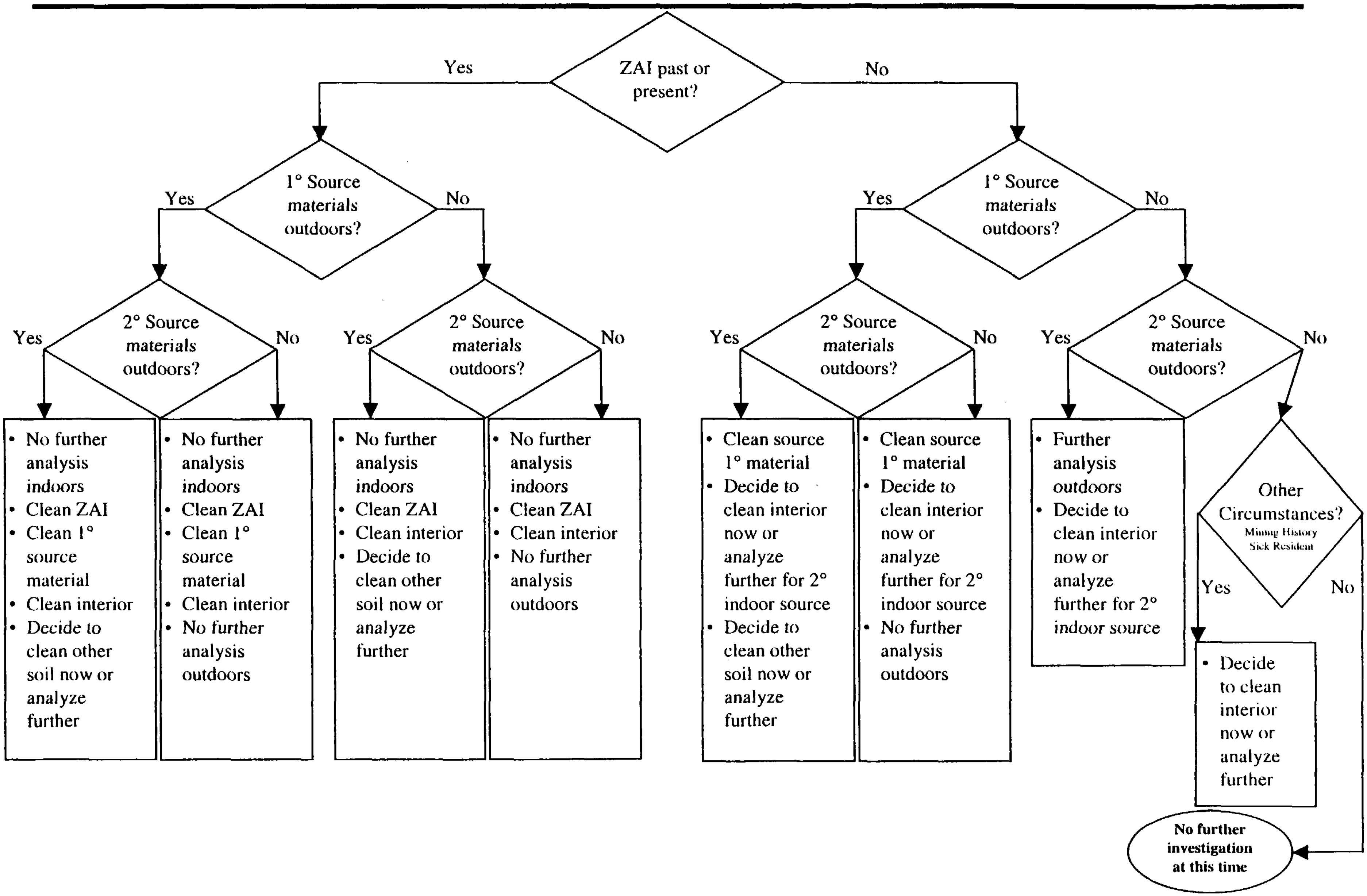
DQOs were reviewed and used to design the study/sampling process detailed in this SAP (Sections 4 and 5).

Figure 3-1: Conceptual Site Model



* Figure created by the Syracuse Research Group (version 7, April 2, 2002)

Figure 3-2: Alternative Action Decision Tree



Section 4
Sampling Program, Rationale, and Locations

Sections 4 and 5 comprise the FSP for the Libby RI CSS activities. This section describes the screening process and soil sampling for residential and commercial properties within the study area. Specific sampling methods and procedures are presented in Section 5.

4.1 Contaminant Screening Study

The CSS will use a combination of visual inspection, verbal interviews, and outdoor soil sampling to identify both primary and secondary sources of LA within the study area. Screening and sampling will focus on areas where vermiculite products are most likely to be encountered (e.g., attic insulation, garden soil amendments) and where disturbance/exposure is most likely to occur (e.g., near-surface soils as opposed to soil at depth). Results of the investigation will be used to classify properties (or portions of properties) within the study area with the following designations:

- Property has no indication of primary or secondary sources inside or outside. No further investigation at this time.
- Property has primary sources of LA and immediate cleanup activities may be conducted.
- Property does not have primary sources of LA but there are indications that secondary sources are, or may be, present. Further investigation may be required to determine if cleanup activities are necessary.

4.2 Study Boundaries

The CSS will focus on all residential and commercial properties within the study area (Figure 2-2). Natural physiographic features have generally defined the study area, which encompasses the city of Libby and surrounding areas where LA contamination has historically been found. The total study area is approximately 192 square miles (mi^2). Areas where structures do not exist and/or where conditions indicate (e.g., vegetation predates mining activities) sources of contamination were not introduced will not be included in the CSS investigation except on a case-by-case basis after consultation with EPA. The study area boundaries may be adjusted as the extent of contamination becomes clear. Also, specific properties with unique or complex circumstances (e.g., large or many buildings) may be addressed with a modified sampling approach slightly different than the approach detailed in this SAP. An addendum to the SAP will be prepared for such cases.

4.3 Study Process

The CSS process is designed to systematically screen and sample every property within the study area and will include the following steps:

- Selecting study locations
- Public awareness and reconnaissance
- Field screening and sampling activities
- Sample analysis and data validation

Figure 4-1 represents the personnel responsible for each step of the CSS process. Figures 4-2 through 4-5 present the responsibilities of each CSS team member specific to the CSS process.

4.3.1 Selecting Study Locations

While the study will initially target the denser populated areas of the study area (e.g., city of Libby), some of the study area border properties will be simultaneously investigated to obtain data from perimeter properties. The purpose of this approach is to provide information to decision makers during the investigation as to any contamination trends that may exist (e.g., perimeter properties having less contamination). In addition, commercial properties will receive priority status, so business owners can become familiar with their situation regarding LA contamination. Approximately 20 to 25 residential and commercial properties will be screened and sampled per day.

Data collected on a daily basis (e.g., questionnaires and northing and easting coordinates) will be entered into a geographic information system (GIS) database and the Libby Project Database in order to provide up-to-date tracking of properties visited and results obtained. This information will be used to evaluate progress and identify areas requiring immediate consideration for potential removal activities.

4.3.1.1 Screen Previous Data

Relevant property data (completed questionnaires and soil sample results) collected during the previous Phase I investigation will be evaluated to determine if sufficient information exists to satisfy the DQOs (Section 3). Soil samples collected from these properties during Phase I activities were analyzed by PLM and then archived. The archived sample will be submitted for additional analysis as described in Section 4.3.4. If sufficient data exists to satisfy the DQOs, then these properties will be exempt from the CSS investigation, and the existing data will be used to confirm the presence or absence of LA.

4.3.1.2 Study Area Grid

A grid system has been applied to the study area (Figure 4-6). The study area is divided into 192 individual grids each measuring 1 mi^2. The grids are numbered from top left to bottom right and identified with a grid number (e.g., 01, 02, 03, etc.). Within each grid, the 1-mi^2 area is divided into four separate ¼-mi^2 quadrants (A [northwest], B [northeast], C [southwest], and D [southeast]). Where properties and populations are denser, the quadrants will be further divided into four separate 1/16-mi^2 sections (1 [northwest], 2 [northeast], 3 [southwest], 4 [southeast]). A grid/quadrant/section will be considered complete when all residential and commercial properties have been:

- Screened and/or sampled (as appropriate) or
- Deemed exempt from the CSS investigation as described in Sections 4.2 and 4.3.1.1

U.S. Forest Service Land
In addition to the residential and commercial properties, a large area of U.S. Forest Service (USFS) land (Kootenai National Forest [KNF]) is within the study area. CDM will coordinate with the KNF forest supervisor to determine the locations of USFS-owned structures within the study area. Access agreements will be obtained and screening and sampling times will be scheduled so the necessary information for these structures can be collected.

4.3.2 Public Awareness and Reconnaissance

Communicating information to the public regarding the CSS investigation is invaluable to the success of this investigation. The communications aspect of the CSS investigation will include:

- Community relations
- Reconnaissance team

4.3.2.1 Community Relations

CDM will coordinate with the EPA community involvement coordinator (CIC) to ensure sufficient advertising (e.g., public meetings, newspaper articles, door flyers, radio announcements, etc.) will be conducted prior to the investigation process. The roles and responsibilities of the CIC are discussed in Section 1. Initially, public announcements regarding the CSS will be advertised throughout the study area to familiarize the community with the investigation approach.

4.3.2.2 Reconnaissance Team

Personal visits will be conducted at the property owners' home approximately 1 week before CSS investigation activities begin in a selected area. This visit will be performed by a CDM reconnaissance team, consisting of two team members each. The field reconnaissance team will be dispatched to a predetermined area to personally notify property owners of the following week's CSS activities. The field reconnaissance teams will visit approximately 25 houses per day. The visit will include explaining the screening and soil sampling process, answering any pertinent questions, obtaining signed access agreements and obtaining any additional useful information (e.g., time when property owner will most likely be available), and completing the verbal and visual inspection discussed below. If property owners are not available during the reconnaissance, the teams will leave a flyer detailing CSS investigation and contact information. The reconnaissance team will revisit properties until the owner can be reached.

Access agreements will be obtained before any screening or sampling activities begin. If a property owner refuses to allow the CSS investigation to be conducted on their property, field activities will not be conducted. A list of property owners who refuse to participate in the CSS will be maintained and provided to the EPA RPM.

4.3.2.3 Contingency Issues

Various scenarios may arise that necessitate prioritizing and scheduling a CSS investigation at specific properties. These scenarios may include, but not be limited to:

- Real estate transactions
- Excessive contamination exposure (e.g., Libby vermiculite attic insulation falling into living space)
- Property damage (e.g., fire, flood, etc.)
- Current remodeling efforts (e.g., exposed areas)
- Community events (e.g., festivals, fairs, parades, etc.)
- Limited times when property owner is available

These situations will be addressed on a case-by-case basis. When a specific property does require an immediate investigation, the property owner will be contacted to schedule an appointment as soon as possible. A field team will then be dispatched to that property to complete the investigation.

4.3.3 Field Screening and Sampling Activities

The CSS screening and sampling activities will be performed by both the CDM reconnaissance team and the CDM field team. The CSS screening and sampling activities will include:

- Visual inspection
- Verbal interview
- Soil sampling

The reconnaissance team will be responsible for visual inspection of Libby vermiculite attic insulation as well as conducting the verbal interview with the property resident and/or owner. Once the reconnaissance team is through with their activities at a particular property, a field team will be dispatched to that property. The field team will be responsible for visual inspection of primary sources of LA on the property as well as conducting the soil sampling.

4.3.3.1 Visual Inspection

The reconnaissance team will visually confirm the presence or absence of Libby vermiculite attic insulation within each structure located at a property. One team member will access the attic and perform a visual inspection, documenting pertinent information in the field logbook, field sample data sheet (FSDS), and screening questionnaire (e.g., information field form [IFF]). The team member will check under other types of insulation (e.g., blown-in cellulose, fiber glass, etc.) to verify that Libby vermiculite attic insulation is not hidden. In addition, the team will investigate other areas where Libby vermiculite attic insulation may be exposed in living spaces (e.g., closets, circuit breaker boxes, etc.).

The field team will inspect all exposed soil areas within the property, paying special attention to areas where known primary sources of LA may have been introduced and "high traffic" areas where contamination is most likely to be tracked indoors. Soil samples will not be collected from land use areas where visible vermiculite product is observed. Instead, the field team will record specific details in the field logbook and the IFF, including location of contaminated source; approximate volume by estimating and noting source location length, width, and depth observed during sampling (depth will only be the depth observed during sampling and no additional effort will be conducted to determine the depth below ground surface to which the source extends); estimated percentage of product; and anecdotal estimates of how long the contaminated source material has existed on the property.

The PPE required for the fieldwork is detailed in the HASP (Appendix B).

4.3.3.2 Verbal Interview

The screening process will also include a verbal interview, conducted by the reconnaissance team, with the property resident and/or owner to acquire background information on the property. The verbal interview is organized to collect as much known history about the property and/or structures to satisfy the DQOs (Section 3). The verbal interview process will involve the following steps:

- Obtain access agreements (if necessary)
- Conduct interview
- Sketch plan-view of house (if Libby vermiculite attic insulation is present)

Obtain Access Agreements
Access agreements will be collected during the reconnaissance team visit with property owners.

Conduct Interview
The interview will address issues such as the use of Libby vermiculite attic insulation (in the house, sheds, barns, etc.) and the possible introduction of other primary sources within (e.g., garden, landscaped areas, etc.) or near (e.g., neighbor) the property. Additional information regarding mine exposure, asbestos-related diseases, and the use of vermiculite in building materials on the property will be collected. The information collected during the interview will be recorded on an IFF (Appendix C).

Structure Sketch
A plan-view sketch of the interior of the structure will be drawn to supplement the questionnaire only if Libby vermiculite attic insulation is present. This sketch will include all floors and detail areas of concern as discussed with the property owner. This information will be used for subsequent removal actions (if necessary) and long-term management decisions. The house sketch will be drawn on the IFF.

Buildings within a specific property will be classified as primary or secondary. A primary building is the main habitable structure (e.g., house, apartment, main commercial space). Secondary buildings include non-habitable structures (e.g., garages, sheds, barns, etc.). A visual inspection to confirm the presence or absence of primary sources of LA will be performed and an IFF will be completed for every building located within the property boundary.

4.3.3.3 Soil Sampling

The purpose of soil sampling will be to identify outdoor soil sources of LA. These sources, although randomly distributed throughout the Libby study area, had specific uses within a property (e.g., soil amendment for gardens, and a fill material). Therefore, the sampling was designed to identify these sources in soils where exposure is most likely to occur.

A two person sampling team will conduct soil sampling activities after the reconnaissance team has finished their visual inspection and verbal interview at the property. The soil sampling process will involve the following steps:

- Sketch property
- Segregate land use areas and zones (if applicable)
- Visually inspect land use areas for vermiculite or LA-containing rock
- Determine sampling locations
- Collect samples
- Record sample locations using global positioning system (GPS) equipment

Sketch Property
A site layout sketch of the property will be drawn prior to sampling. This sketch will include major features (e.g., trees, drainage ditches, utility poles, known underground utilities, etc.) and sampling locations. The site layout sketch will be drawn on the IFF.

Segregate Land Use Areas
The property will be sectioned into land use areas for sampling purposes. Use areas may include, but not be limited to:

- Yard (grassy areas)
- Landscaped area
- Garden
- Fill area

Properties greater than ½ acre in size will be sectioned off into separate zones for increased accuracy in characterization. Sectioning properties into additional zones will be at the discretion of the CDM field team but consistent among the teams. This segregation will be accomplished so that a five-point composite sample will characterize the section. A five-point composite sample will be collected for land areas less than or equal to 1/8 of an acre. An example sampling diagram, detailing how soil samples will be segregated, is included as Figure 4-7.

Since most commercial properties have limited areas of soil and/or grass, soil samples will only be collected if these areas are present.

Determine Sampling Locations
In areas where high concentrations of LA are expected (e.g., yard, garden, stockpiled soil, etc.), it is assumed that the sources were distributed throughout the area (e.g., tilling into a garden). Because of this, composite soil samples will be collected from similar land use areas (e.g., yard, garden, stockpiled soil, etc.). For example, a composite yard sample will only include subsamples originating from the yard land use area (e.g., no garden, fill soils included). Additional composite or grab samples may be collected depending on site conditions (e.g., multiple land use areas, zones, etc.). Conversely, not all land use areas previously mentioned will be applicable at every property and fewer samples (not less than two) will be collected. Up to five composite soil samples will be collected at each property. The CDM field team will use professional judgment in determining how soil samples will be collected in order to adequately characterize each property. Soil samples may also be biased to be collected near observed sources of vermiculite. An example sampling diagram, detailing how soil samples will be segregated, is included as Figure 4-7.

Two to five composite samples will be collected at each property. For non-disturbed areas (e.g., yard), composite samples will be collected from 0 to 1 in. For disturbed areas (e.g., garden, fill area, landscaped areas, etc.), composite samples will be collected from 0 to 6 in. These depths were chosen based on the site conceptual model. Mechanical disturbance, resulting in release and exposure to LA, to the 6-in. depth is likely in areas such as gardens or play areas through rototilling and digging; whereas, mechanical disturbance is only likely on the surface for grassy areas through mowing. All composite soil samples will have no more than five subsamples (e.g., five-point composite sample). Site conditions may require that fewer subsamples be collected.

Collect Samples
All soil samples will be collected in accordance with SOP CDM-LIBBY-05, Site-Specific Standard Operating Procedure for Soil Sample Collection.

Record GPS Locations
For each sample collected and structure surveyed, a GPS point will be recorded. The GPS point will be collected outside the main entrance to each structure. Since soil samples will consist of composites, the midpoint of each composite group of samples will be recorded. All necessary information will be entered into the GPS data dictionary.

Location identification numbers will be assigned for each sample location. Location identification numbers include building location identification numbers (BD) and sample point location identification numbers (SP) numbers, as discussed below. Each structure on a property will be surveyed using GPS field equipment, and a location identification number associated with the structure will be assigned. Identification numbers associated with structures will be in the form BD-#####. For each sample point collected outside a building, GPS points will be collected, and the location identification number associated with the sample point will be in the form of SP-#####. The procedure for fully implementing this process is currently in development by CDM and the Volpe Center, and will be incorporated into this SAP when finalized.

4.3.3.3 Dust Sampling

Dust samples will not be collected in conjunction with the CSS investigation. However, if during the investigation circumstances arise where EPA chooses to have dust samples collected, they will be collected in accordance with Libby Asbestos Project Phase I QAPP (EPA 2000a).

4.3.4 Sample Analysis and Data Validation

Soil samples will be analyzed for LA by the IR method (ISSI-LIBBY-02). Depending on sample results, a sample split may be submitted for analysis using the SEM method (Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy, Revision 0, May 6, 2002). The process describing when and how many SEM splits are submitted for analysis is described in Section 7.

When sample data packages are received, the RAC PM will coordinate the data validation and entry of qualifiers added during validation to results in the Libby Project Database. The data validation process will follow the procedures outlined in

Section 7 and the site-specific SOP for Data Validation of Asbestos Results Obtained by Reflectance Spectroscopy and Scanning Electron Microscopy (Appendix C). The RAC project manager will notify the CIC as samples are validated and results are available from the Libby Project Database. The CIC will draft an initial letter format, and CDM will then complete a letter to each property owner and/or occupant detailing the results of the investigation and additional information regarding any necessary further activities.

This page intentionally left blank.

Figure 4-1: CDM Team Members Associated with Each Step of the CSS Process

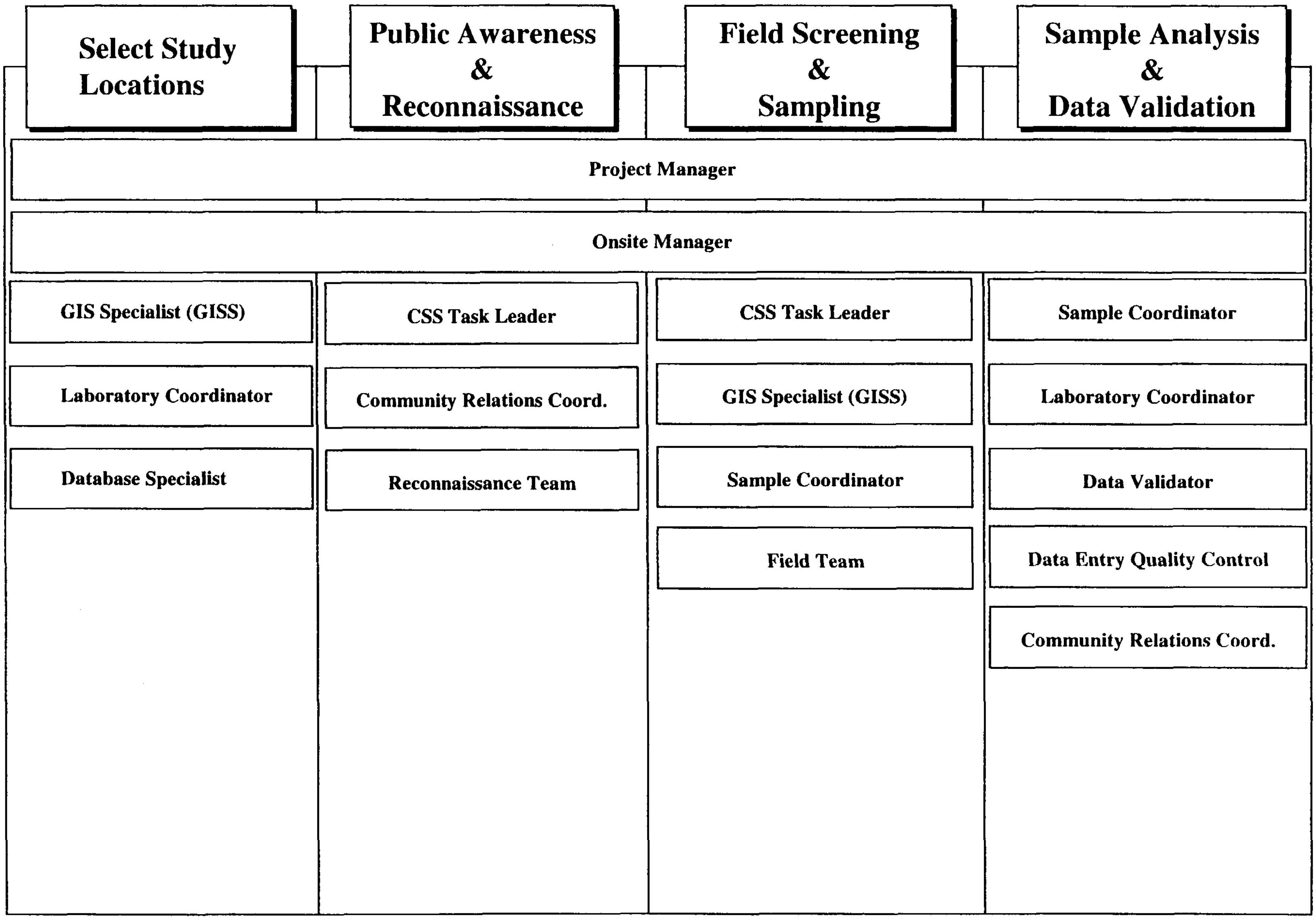


Figure 4-2: Responsibilities by Team Member for Selecting Study Locations

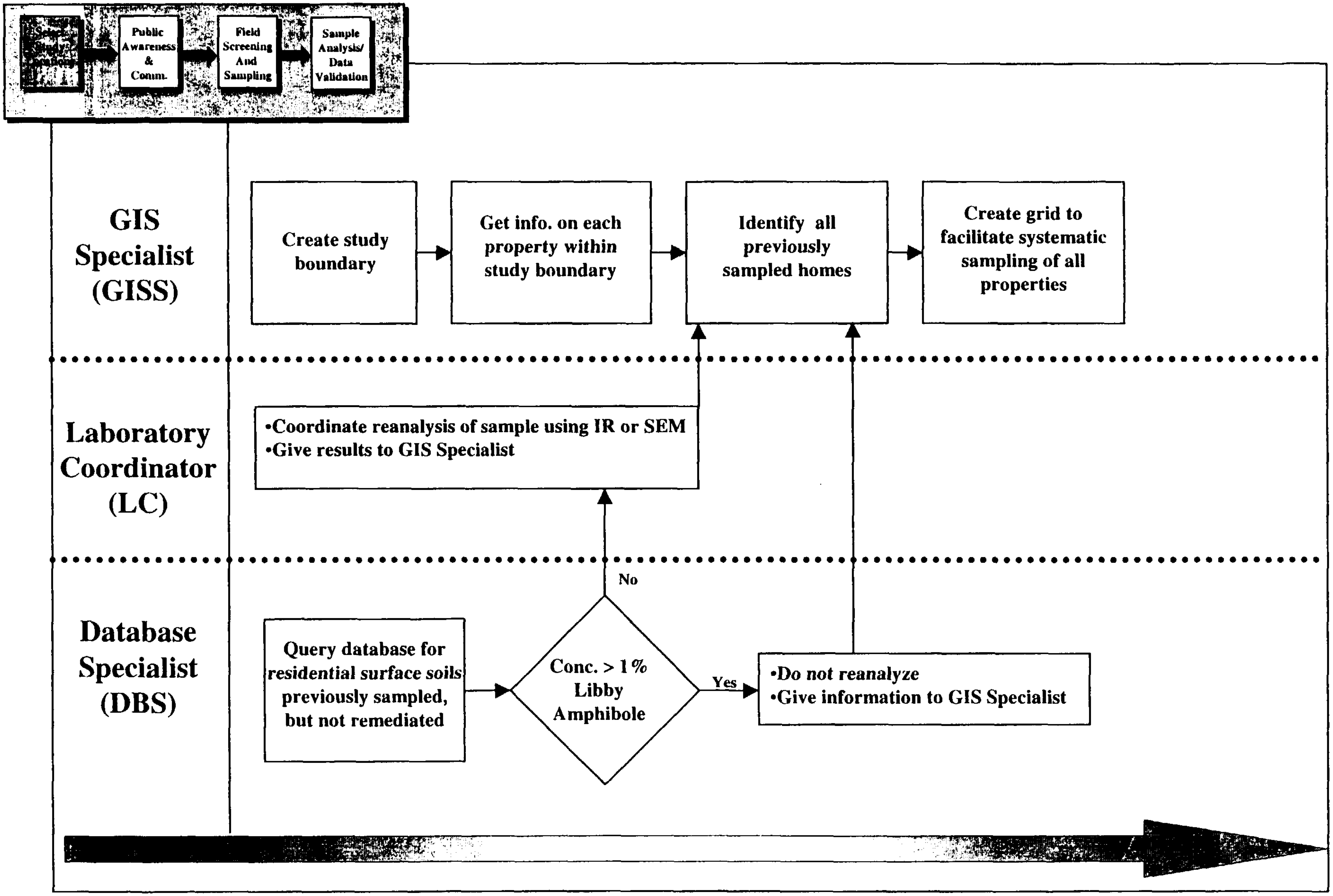


Figure 4-3: Responsibilities by Team Member for Public Awareness and Reconnaissance

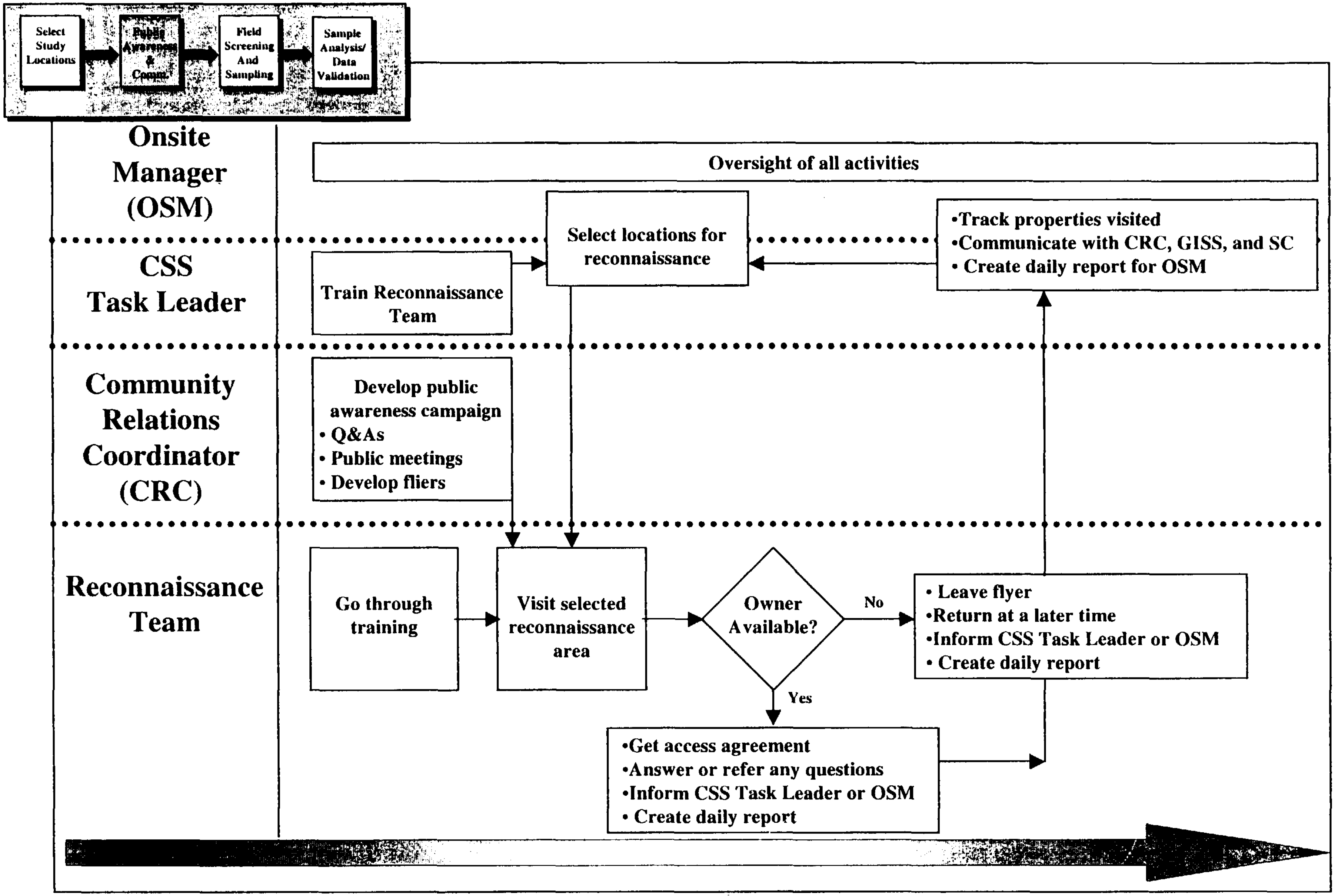


Figure 4-4: Responsibilities by Team Member for Field Screening and Sampling

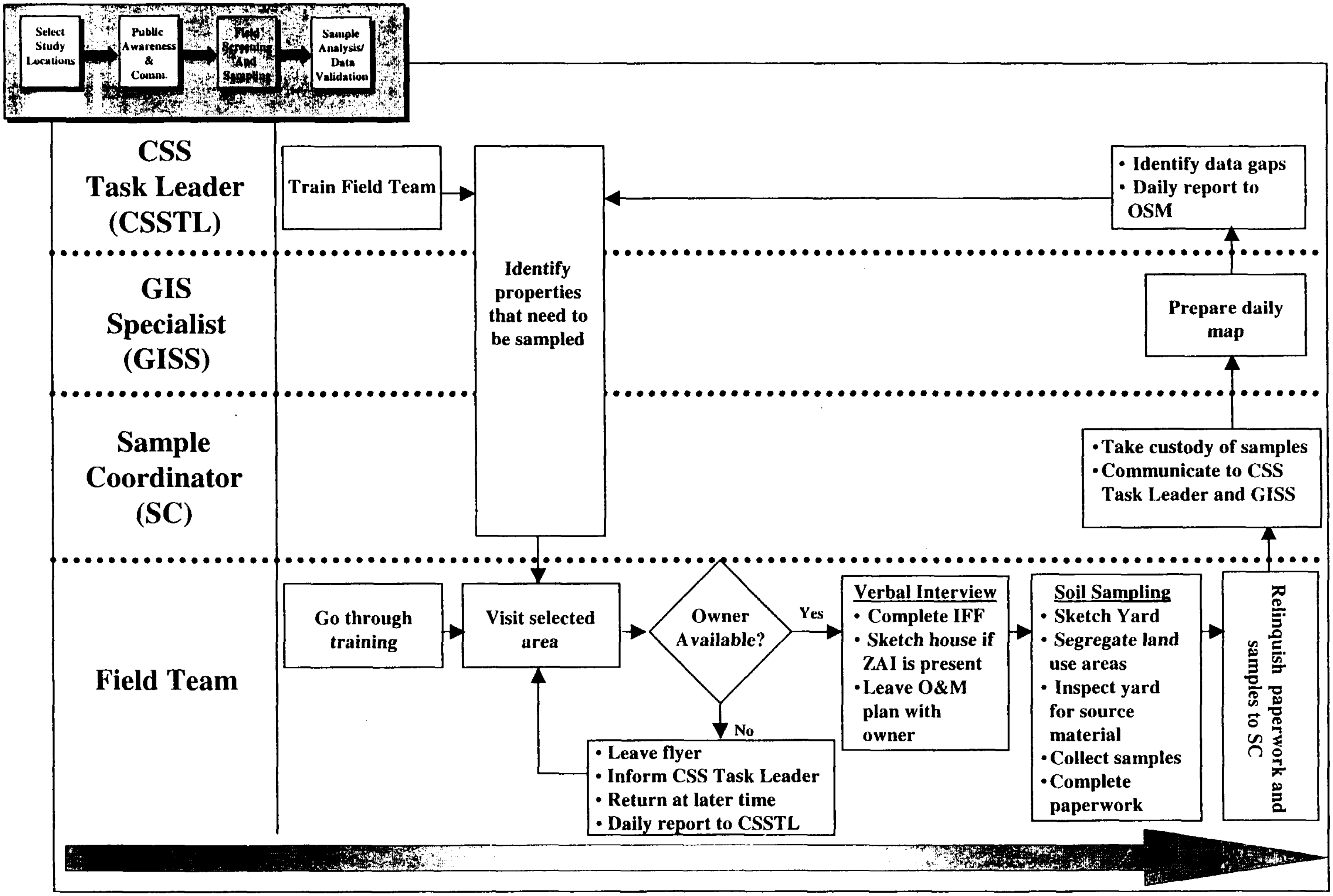
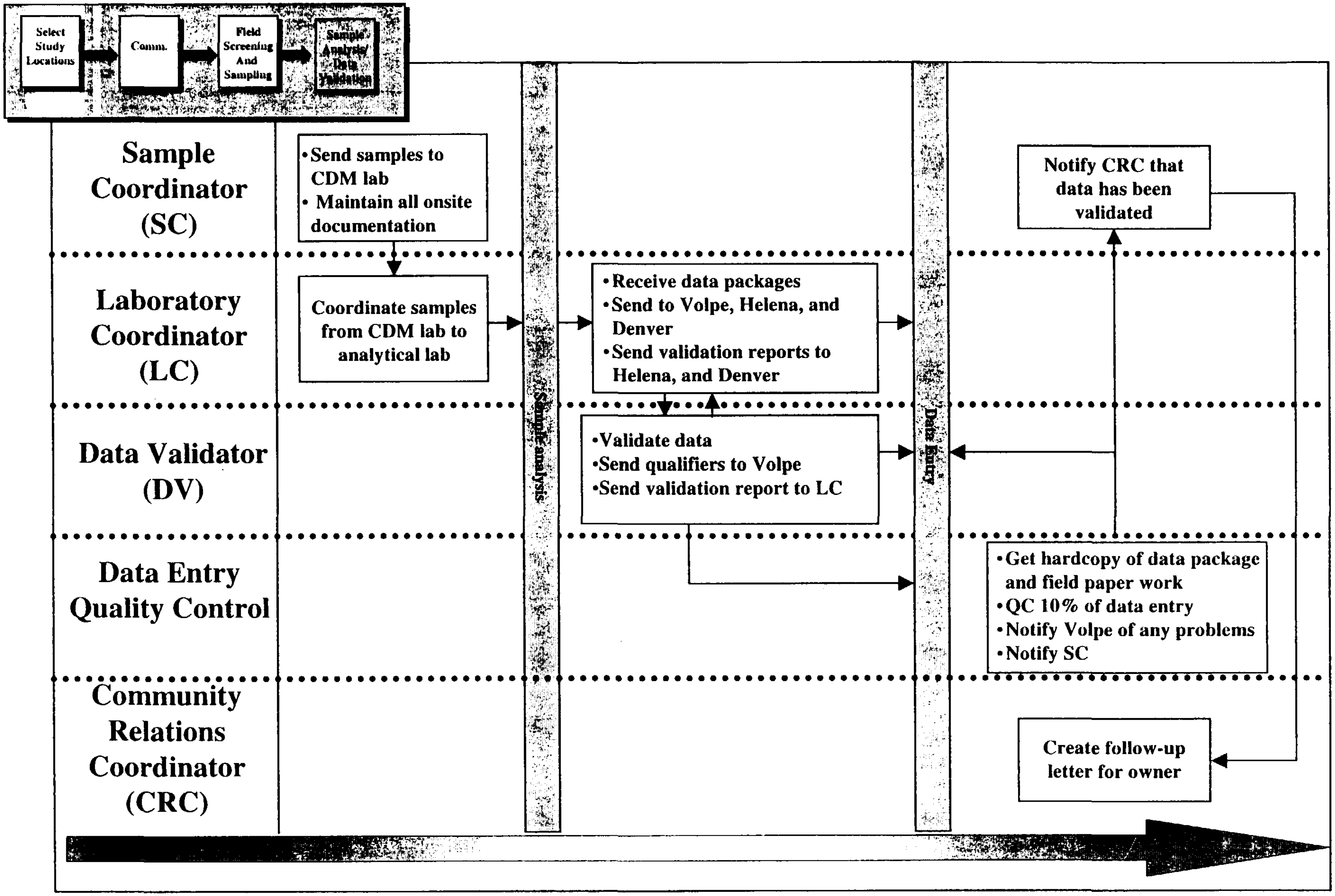


Figure 4-5: Responsibilities by Team Member for Sample Analysis and Data Validation



Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Poor Quality Source Document

The following document images have been scanned from the best available source copy.

To view the actual hard copy, contact the Superfund Records Center at (303) 312-6473.


Detail View
Contaminant Screening
Study Grid Tiles
Libby, Montana
Figure 4-6
CDM

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Section 5
Field Activity Methods and Procedures

The following is a summary of field activities that will be performed by CDM personnel during the CSS investigation at Libby, Montana.

- Mobilization/demobilization
- Field documentation
- Screening questionnaire
- Soil sample collection
- Equipment decontamination
- Investigation-derived waste containment

The following subsections reference CDM SOPs, where applicable, or provide site-specific procedures if there are not applicable SOPs. The following SOPs (CDM 2001) and site-specific guidance documents are included in Appendix C:

SOP 1-2	Sample Custody (with modifications)
SOP 2-1	Packaging and Shipping of Environmental Samples (with modifications)
SOP 2-2	Guide to Handling of Investigation-Derived Waste (with modifications)
SOP 4-1	Field Logbook Content and Control
SOP 4-2	Photographic Documentation of Field Activities (with modifications)
SOP 4-5	Field Equipment Decontamination at Nonradioactive Sites (with modifications)

In addition, the following alternative SOPs will be used during the CSS investigation:

CDM-LIBBY-01	Data Validation of Asbestos Results Obtained by Reflectance Spectroscopy
CDM-LIBBY-02	Data Validation of Asbestos Results Obtained by Scanning Electron Microscopy
EPA SOP ISSI-LIBBY-01	Soil Sample Preparation

Two site-specific guidance documents have been developed to standardize the completion of field forms. These guidance documents are included in Appendix C.

CDM-LIBBY-03	Completion of Field Sample Data Sheets
CDM-LIBBY-04	Completion of Information Field Forms
CDM-LIBBY-05	Site-Specific Standard Operating Procedures for Soil Sample Collection

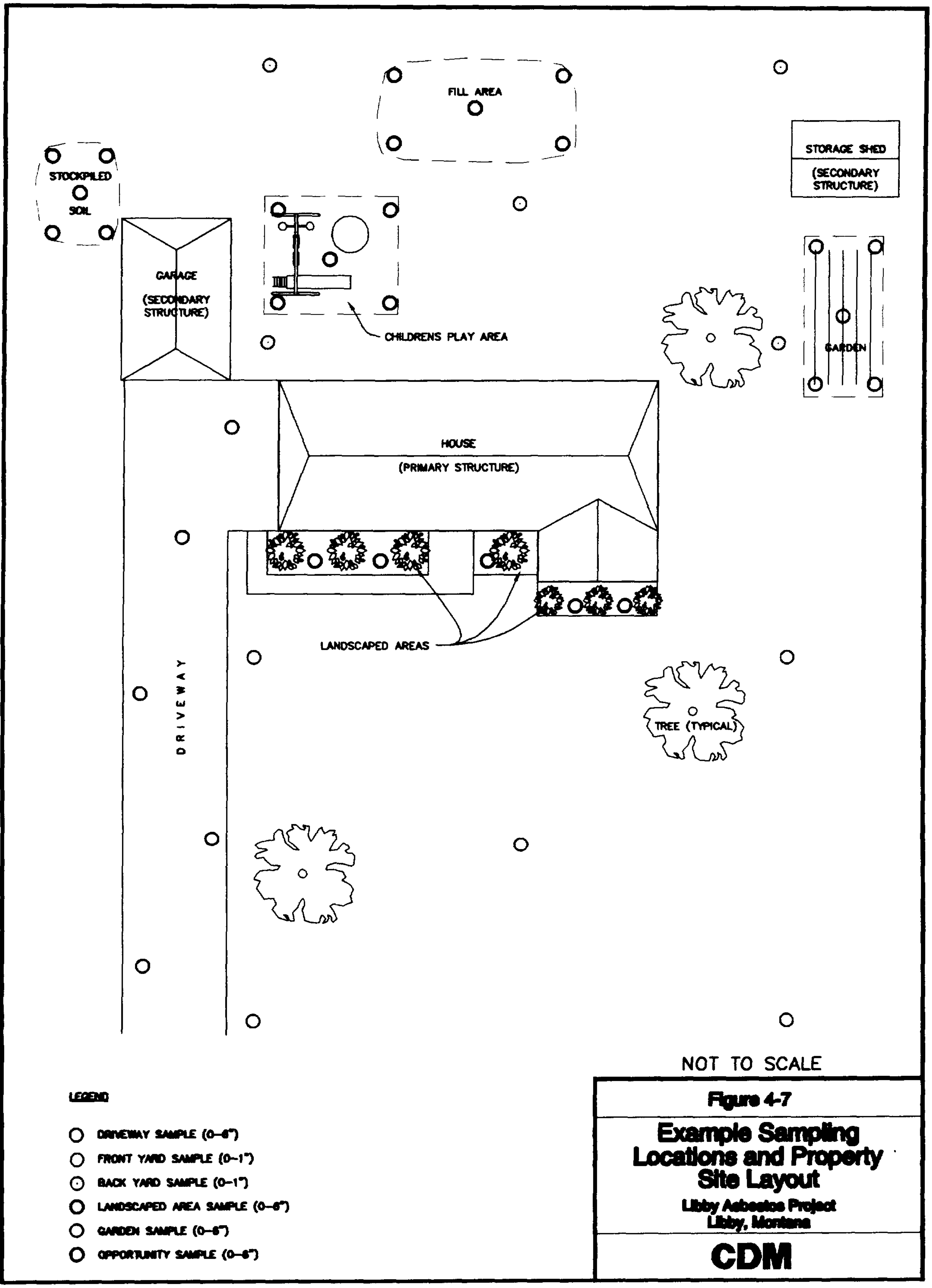


Figure 4-7

Example Sampling Locations and Property Site Layout

Libby Asbestos Project
Libby, Montana

CDM

The HASP is included in Appendix B.

5.1 Mobilization/Demobilization

CDM has been supporting the ERB activities in Libby since 1999 and currently leases office space at 404 Highway 2 West in Libby. As a result, the majority of mobilization activities associated with initial setup are complete. However, startup activities for this sampling season will need to take place.

CDM will identify and provide all necessary personnel, equipment, and materials for the purpose of conducting the CSS investigation. A complete inventory of available equipment and supplies will be conducted prior to initiating the field activities and any additional required equipment or supplies will be obtained. All field personnel will be trained in the field on the objectives of the CSS as well as specifics on how to perform their assigned tasks.

CDM has identified the equipment and supplies necessary to support the CSS field activities. These items are summarized in Table 5-1. CDM will provide all sampling equipment used to collect and contain samples for analyses. A list of required sample containers is included in Table 5-2. Prior to acceptance, a field team leader will inspect all supplies and consumables to ensure that they are in satisfactory condition and free of defects.

Prior to the mobilization for field activities, a field-planning meeting will be conducted by the CDM onsite manager and attended by the CDM project manager, available field staff, health and safety officer (HSO), and a member of the QA staff. The CDM onsite manager will notify a member of the QA staff and an HSO of the agenda before the meeting. The agenda will be reviewed and approved by the QA staff and the HSO prior to the meeting. In addition, daily field planning meetings will be held at the CDM Libby office by the CDM onsite manager and attended by the current field staff. The participants at all meetings will sign an attendance list. The field-planning meeting will discuss and clarify:

- Objectives and scope of the field work
- Equipment and training needs
- Number and types of samples and analyses
- Field operating procedures, schedule of events, and individual assignments
- Required QC measures
- Safety issues
- Documents governing field work that must be on site

- Community relations
- Interactions with the media
- Any changes in the field planning documents

Additional meetings will be held when the documents governing fieldwork require it or when the scope of the assignment changes significantly.

Daily field planning meetings will discuss the previous days events and planned activities for the current day. Any changes to project procedures, schedules, or other pertinent project updates will be discussed. New field team members will be introduced and assigned to work with an experienced team member.

Copies of the field-planning meeting agenda, daily field planning meeting notes, and meeting attendance lists will be distributed to the project files by the CDM project manager.

5.2 Field Documentation

Detailed sampling notes will be recorded for each sample in accordance with CDM SOP 4-1, Field Logbook Content and Control. Photographic documentation will be recorded for each site in accordance with CDM SOP 4-2, Photographic Documentation of Field Activities. For each property surveyed, the building location identification (BD) number of the IFF form, the COC number, and FSDS number should be referenced in the logbook. FSDSs and IFFs will be completed for each site in accordance with the CDM project-specific SOP, Completion of Field Sample Data Sheets. An example FSDS is included in Appendix C.

5.2.1 Field Logbooks and Records

Field logbooks will be maintained in accordance with SOP 4-1, Field Logbook Content and Control. The log is an accounting of activities at the site and will duly note problems or deviations from the governing plans and observations relating to the sampling and analysis program. The sample coordinator will manage the logbooks and will send original field logbooks, as they are completed, to the CDM office in Helena, Montana for document control. A copy of each logbook will be maintained in the CDM office in Libby, Montana and Denver, Colorado. The distribution of all field paperwork is discussed in Section 5.5.

5.2.2 Corrections to and Deviations from Documentations

Logbook modification requirements are described in CDM's SOP 4-1, Field Logbook Content and Control. For the logbooks, a single strikeout initial and date is required for documentation changes. The correct information should be entered in close proximity to the erroneous entry. These procedures will also be followed for the correction of any field form (FSDS, IFF, and COC). All deviations from the guiding documents will be recorded in the logbooks and the Libby Asbestos Project Record of

Deviation/Request for Modification Form (Appendix D). Any major deviations will be documented according to the quality management plan (CDM 1996b).

5.3 Screening Questionnaire

An IFF screening questionnaire will be completed for each structure within a property boundary, as described in Section 4.3.3.1. Information will be obtained from the property owner and occupant (if different). All IFFs will be completed in accordance with the CDM project-specific SOP, Completion of Property Information Field Form. An example IFF is included in Appendix C.

5.4 Soil Sampling

The procedures presented in this section are brief summaries of the referenced SOPs and provide additional site-specific detail that may not be discussed in the individual SOPs. For additional information, CDM field personnel will refer to the SOPs included in Appendix C. The HASP should be consulted to determine the health and safety protocol for performing specific activities.

Soil samples will be collected from specific land use areas as described in Section 4.3.3.2. All soil samples will be collected in accordance with CDM SOP CDM-LIBBY-05.

5.4.1 Sample Preparation

All soil samples will be shipped to the designated laboratory for further preparation (i.e., drying, splitting, archiving, etc.) in accordance with EPA SOP ISSI-LIBBY-01 (Appendix C). Prepared samples will be shipped to a specified laboratory for analysis.

Chain-of-custody procedures will be maintained from sample collection through the processing phase and subsequent shipping to the analytical laboratory. Prior to the shipment of any samples for analytical analysis, the laboratory coordinator will be contacted to determine the appropriate laboratory that should receive those samples. The laboratories that will provide analytical services have not yet been identified.

5.4.2 Field Equipment Blanks and Rinsate Samples

Soil samples will be collected using non-disposable equipment (i.e., trowels, bowls, spoons, etc.). Field equipment blanks and rinsates samples are collected to determine if decontamination procedures of field equipment used to collect asbestos samples are adequate to prevent cross-contamination of samples during sample collection.

Field equipment blanks will be collected at the end of each day from equipment used by different field teams to collect soil samples for asbestos analysis. These samples will be collected using silica sand that is asbestos free as analyzed by IR. Field equipment blanks will be collected by placing silica sand in a decontaminated mixing bowl used to homogenize samples. The silica sand will be mixed in the bowl using decontaminated equipment that was used to collect soil samples. The silica sand will then be submitted as a sample for analytical analysis. Field equipment blanks will be submitted with paired aqueous rinsate samples during the first week of sample collection, the week during the middle of the field investigation (on or about the week of August 12th), and during the last week of the field investigation (on or about the week of October 28th). Aqueous rinsate samples will be collected at the same rate (one per day) as the field equipment blanks during the 3 weeks they are collected. The aqueous samples will be collected from the same equipment the field equipment blank is collected from. The field equipment blank will be collected before the aqueous rinsate sample is collected. The frequency of field equipment blank and rinsate sample collection may be adjusted, as the relationship between cross-contamination and sample results is understood. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2. After equipment has been decontaminated, American Society for Testing and Materials (ASTM) Type II water will be used to collect the rinsate sample. A list of required rinsate sample containers and sample volume is indicated on Table 5-2.

5.4.3 Field Sample Custody and Documentation

Sample custody and documentation will follow the requirements specified in CDM's SOP 1-2 Sample Custody and site-specific SOPs for completion of field data sheets and chain-of-custody forms. All samples and sampling paper work (chain-of-custody forms, field data sheets, survey forms, etc.) will be relinquished to the sample coordinator at the end of each day. The sample coordinator will be responsible for management of all IFFs, FSDSs, and COCs. The distribution of all field paperwork is discussed in Section 5.5.

5.4.4 Sample Labeling and Identification

Samples will be labeled with index identification numbers supplied by the Volpe Center. These numbers will be maintained by the sample coordinator and signed out by sampling teams. Sample index identification numbers will identify the samples collected during the CSS by having the following format:

CSS-#####

Where:

CSS = Contaminant screening study
= A sequential five digit number

5.4.5 Chain-of-Custody Requirements

Chain-of-custody (COC) procedures and sample shipment will follow the requirements stated in CDM's SOP 1-2, Sample Custody and SOP 2-1 Packaging and Shipping of Environmental Samples. The COC record is used as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A complete COC record is required to accompany each shipment of samples.

At the end of each day, all samples will be relinquished to the sample coordinator by the sampling team following COC procedures. The sample coordinator will follow COC procedures to ensure proper sample custody between acceptance of the samples from the field teams to shipment to the laboratory.

5.4.6 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with CDM's SOP 2-1, Packaging and Shipping of Environmental Samples, with modification. Custody seals will be placed over at least two sides of the cooler and then secured by tape if custody is released to a non-sampler. All samples will be shipped by an overnight delivery service to the designated laboratory. The sample coordinator will be responsible for packaging and shipment of samples. The following modifications to SOP 2-1 have been reviewed and approved:

Section 1.4, Required Equipment - Vermiculite (or other absorbent material), bubble wrap, or ice will not be used for packaging or shipping samples.

Section 1.5, Procedures - Lining the cooler with a garbage bag is determined not to be necessary since the samples will already be double bagged. No vermiculite or other absorbent material will be used to pack the samples. No ice will be used.

5.5 Field Paper Work Distribution

The distribution of all field paper work is discussed below and presented in Figure 5-1, and the paper work flow process at the Volpe Center is provided in Appendix E.

Access Agreements

Original access agreements will be filed in the residential folders maintained in the CDM Libby office. Copies also will be sent to both the CDM Helena and CDM Denver offices for the Volpe Center and RAC project files, respectively. These copies will be sent on Fridays by a courier service (i.e., Federal Express).

Information Field Forms (IFFs)

Original IFFs will be filed in Libby by BD number. Copies will be filed in the residential folders maintained in the CDM Libby office. Copies also will be sent to both the CDM Helena and CDM Denver offices for the Volpe Center and RAC project files, respectively. These copies will be sent on Fridays by a courier service (i.e., Federal Express). An additional copy will be faxed to the Volpe Center daily for data entry.

Field Sample Data Sheets (FSDSs)

Original FSDSs will be filed in Libby by sheet number. Copies will be filed in the residential folders maintained in the CDM Libby office. Copies also will be sent to both the CDM Helena and CDM Denver offices for the Volpe Center and RAC project files, respectively. These copies will be sent on Fridays by a courier service (i.e., Federal Express). An additional copy will be faxed to the Volpe Center daily for data entry.

Chain-of-Custody (COC) Forms

The white and yellow copies of the COCs will accompany samples during shipment. The pink copy will be sent to the CDM Helena office to be filed in the Volpe Center project files. These copies will be sent on Fridays by a courier service (i.e., Federal Express). A copy of all COCs will be maintained in the Libby office. These copies will be filed by COC number. An additional copy will be sent to the CDM Denver office for the RAC project files. These copies will be sent on Fridays by a courier service (i.e., Federal Express). An additional copy will be faxed to the Volpe Center daily for data entry.

Logbooks

As logbooks are completed, originals will be sent to the CDM Helena office for the Volpe Center project files. Copies will be maintained in the CDM Denver office (for the RAC project files) and in the Libby office. In addition, pages relevant to a specific property will be maintained in the residential file folders in the Libby office.

Data Packages and Data Validation Reports

Original data packages and data validation reports will be filed in the CDM Helena office in the Volpe Center project files. Copies will be maintained in the CDM Denver office in the RAC project files.

5.6 Equipment Decontamination

Equipment used to collect, handle, or measure soil samples will be decontaminated in accordance with CDM SOP 4-5, Field Equipment Decontamination at Nonradioactive sites, with modifications. The following modifications to SOP 4-5 have been reviewed and approved:

<u>Section 4.0, Required Equipment</u> - Plastic sheeting will not be used during decontamination procedures. ASTM Type II water will not be used. Rather, locally available deionized water (DI) water will be used.

<u>Section 5.0, Procedures</u> - Decontamination water will not be captured and will be discharged to the ground at the property.

<u>Section 5.6, Waste Disposal</u> - Decontamination water will not be captured and will not be packaged, labeled, or stored as investigation-derived waste (IDW).

5.7 Investigation-Derived Waste

IDW at each property will consist of excess sample volume, spent decontamination supplies, and personal protective equipment (PPE). All IDW will be handled in accordance with CDM SOP 2-2, Guide to Handling IDW, with modifications. The following modifications to SOP 2-2 have been reviewed and approved:

Section 5.2, Offsite Disposal - All spent sampling IDW (i.e., paper towels, respirator cartridges, etc) will be collected in transparent garbage bags and marked "IDW" with an indelible marker. These bags will be deposited into the asbestos-contaminated waste stream for disposal.

5.8 Health and Safety Air Monitoring

Air samples will be collected for health and safety. Procedures are outlined in the Phase I QAPP (EPA 2000a).

Table 5-1 Sampling Supply and Equipment Checklist

General	
SAP	Alconox (4 pound box)
Access agreement forms (completed and blank)	Water sprayer
Information field forms (screening questionnaire)	Scrubbing brush (2)
Field logbook	De-ionized water (2 gallons)
FSDS	1 liter HDPE containers
Chain-of-custody (COC) forms	Aluminum foil
Sheets of index IDs	Paper towels
Sheets of location IDs	Measuring tape
GPS unit	Tape - clear, duct, and strapping
Digital camera	Ice chests (2)
Trowel or bulb planter	Garbage bags (transparent)
Mixing bowl/Spoons	Ladder
Zip-top plastic bags (quart size)	Flashlight
Indelible markers and pens (Sharpie, extra fine)	Information flyer (to be left with property owner)
Decon buckets - 5 gallon	Clipboards
Health and Safety	
First aid kit	Steel-toed boots
Tyvek coveralls	Gloves - cotton and nitrile
Respirator and cartridges (see HASP)	Respirator cleaning wipes
Safety glasses	Cellular telephone/radio
Fire extinguisher	

Table 5-2 Sample Containers

Soil Samples			
Container	**Size**	**Quantity**	**Required Volume**
Zip-top plastic bags	Quart	1 per sample	100 g
Rinsate Samples*			
Container	**Size**	**Quantity**	**Required Volume**
HDPE Container (wide mouth)	1 L	2 per sample	800 ml

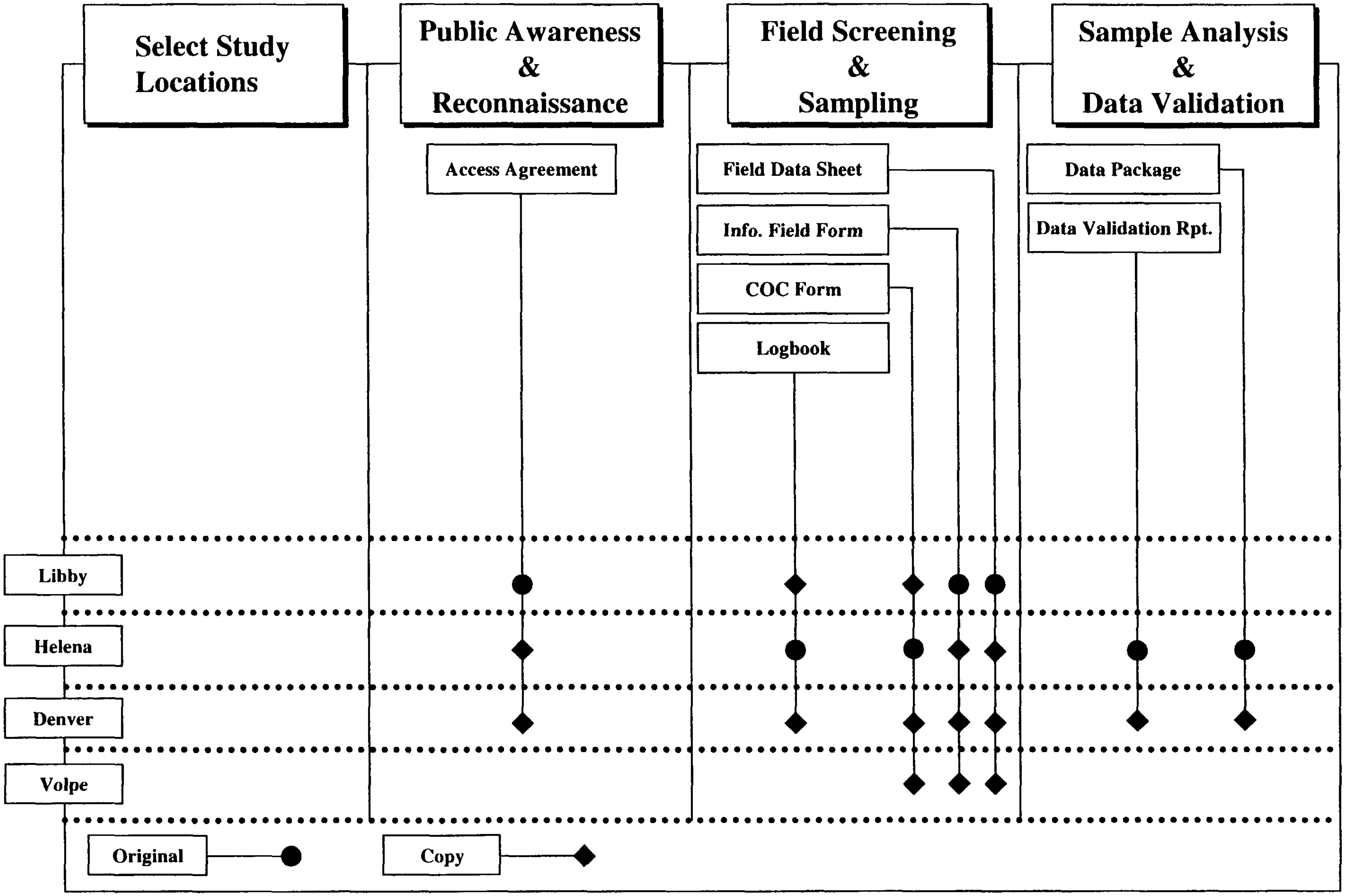
*Rinsate samples will only be collected during the first week of the CSS investigation at a rate of one per day. Additional rinsate samples may be collected pending results of the initial rinsate samples.

Acronyms

g grams
HDPE high-density polyethylene
L liter
ml milliliters

This page intentionally left blank.

Figure 5-1: Document Filing Associated with Each Step of the CSS Process



Section 6
Laboratory Analysis and Requirements

The laboratories used for all sample analyses will have participated in, and acceptably analyzed, the required parameters in the last two proficiency examinations from both the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program (NIST/NVLAP). The laboratory must also analyze performance evaluation (PE) samples on a voluntary basis. These analyses must be performed before any samples are submitted to the laboratory to confirm the laboratories capabilities and may be subsequently submitted at regular intervals. In addition, the laboratory must participate in the laboratory training program developed by the Libby laboratory team. The current outline for this training program is provided in Appendix F, but is expected to updated periodically as it is part of a continuous improvement program for analysis of Libby samples.

6.1 Analytical Methods

The analytical laboratories that will be utilized to analyze samples for the CSS have not yet been identified.

Soil samples will be analyzed for LA by IR or SEM methods listed below:

SEM (Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy, May 6, 2002, Revision 0 [EPA 2000c])
IR (ISSI-LIBBY-02)

The IR method is still in development and will be distributed upon its completion.

Rinsate samples, following the preparation procedure EPA600/4-84-043, will be analyzed by the transmission electron microscopy (TEM) method International Organization of Standards (ISO) 10312.

6.2 Reporting Limits

The reporting limit for soils analyzed by SEM and IR is 0.1 percent and is equal to the method detection limit. The reporting limit for rinsate samples will be based on a 10-grid opening. The reporting limits provided are the minimum levels to which the laboratory will report results without a qualifier when LA is detected.

6.3 Holding Times

Technical holding times are storage times allowed between sample collection and sample analysis when the designated preservation and storage techniques are employed. No preservation requirements or holding times are established for soil or water samples collected for asbestos analysis.

6.4 Laboratory Custody Procedures and Documentation

Laboratory custody procedures are provided in the laboratories' QA management plan, which are approved by CDM as part of the laboratory procurement process. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping cooler and the individual samples. This inspection will include verifying sample integrity. The enclosed COC records will be cross-referenced with all of the samples in the shipment. The laboratory sample custodian will sign these records and provide copies for placement in the project files. The sample custodian may continue the COC record process by assigning a unique laboratory number to each sample on receipt. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, and data reporting.

6.5 Laboratory Quality Assurance Program

Samples collected during this project will be analyzed in accordance with standard EPA and/or nationally recognized analytical procedures (i.e., Good Laboratory Practices [GLP]). The purpose of using standard procedures is to provide analytical data of known quality and consistency. Analytical laboratories will be provided a copy of and will adhere to the requirements of this SAP.

6.6 Documentation and Records

Data reports will be submitted to the CDM laboratory coordinator and include a case narrative that briefly describes the number of samples, the analyses, and any analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed chain-of-custody forms, analytical data, a QC package, and raw data, where applicable. Raw data is to consist of instrument preparation logs, instrument printouts of field standards, and QC sample results including IR and EDS spectra and SEM photos (as appropriate), instrument maintenance records, COC check in and tracking, raw data instrument print outs of sample results, analysis run logs, and sample preparation logs. All original data reports will be filed in the CDM office in Helena, Montana and a copy filed in the CDM office in Denver, Colorado. The laboratory also will provide an electronic copy of the data to the laboratory coordinator and others as directed by CDM.

6.7 Data Management

Sample results data will be delivered to the Volpe Center and CDM's Cambridge office both in hard copy and as an electronic data deliverable (EDD). Electronic copies of all project deliverables, including graphics, will be filed by project number. Electronic files will be routinely backed up and archived.

All results, field data sheet information, and survey forms will be maintained in the Libby project database managed by the Volpe Center. The distribution of all paper work is discussed in Section 5.5 and shown in Figure 5-1.

This page intentionally left blank.

Section 7
Quality Assurance/Quality Control Program

The field QA program has been designed in accordance with CDM's RAC VIII Quality Management Plan (QMP) (CDM 1996b), CDM's RAC Region VIII QAPP (CDM 1996a), EPA's Guidance for the DQO Process (EPA 2000b), and EPA's Requirements for QAPPs for Environmental Data Operations, QA/R-5, Final (EPA 2001b).

A QA/QC program has been developed for the CSS to ensure that the quality of the data collected in the field can be assessed. This section outlines where in the CSS process potential data quality problems can occur, what QA/QC measures are in place to monitor any problems, and what corrective actions will be taken to address those problems.

7.1 Study Process

QA/QC procedures can be found at each step within the CSS four-step process (i.e., selecting study locations, public awareness and reconnaissance, field screening and sampling activities, and sample analysis and data validation) (Fgures 7-1 and 7-2). The QA/QC measures associated with the CSS study are discussed below followed by a detail of the study process, the potential problems with each step of the study process, the QA/QC measures designed to mitigate the problems, and the corrective actions to prevent reoccurrence of problems.

Reconnaissance and Field Team Orientation

Due to the longevity of the CSS, several field team members will rotate shifts throughout the field effort. CDM will make a conscious effort to utilize personnel (when available) with prior experience in performing similar activities in the Libby Asbestos Project Phase I investigation. All reconnaissance team members will be required to participate in a reconnaissance team orientation, which will cover the overall CSS process, personal communication skills, access agreement form completion, and identification of primary and secondary contamination sources.

All field team members, and QAM will be required to participate in a field team orientation, which will include discussing the CSS investigation approach, sampling techniques, communication skills, access form completion, identification of primary and secondary LA sources, and proper completion of all field forms.

Field Form Completion Checks

All field forms (IFF and FSDS) will be completed in the field before leaving a property. To ensure that all applicable data is entered and all necessary fields are completed, a different field team member will check each field form. The CSS task leader will also complete periodic checks of all field forms.

Supplemental Verification

Supplemental verification of vermiculite product will be performed when the field team cannot identify, with confidence, vermiculite and/or primary sources of LA product. The CSS task leader will meet the field team at the property to assist in the identification process.

Screening Field Checks

Screening field checks will also be conducted on properties where the CSS investigation has been completed. The CSS task leader will use the completed field forms and revisit the property to verify the correct information has been recorded. Screening field checks will be conducted at a rate of 2 percent (1 per 50) properties. Field checks will also be completed as the CSS task leader periodically observes sample teams collecting and recording information.

Field Audits

A field audit will be performed during the first month of the field effort. The field effort is expected to last for 6 months, with a minimum of two field audits. If significant CSS procedural changes occur during the study, additional field audits will be conducted to ensure the new methods are implemented and followed appropriately. In addition, opportunistic audits may be necessitated by the findings of screening field checks completed by the CSS task leader. The QAM will be the point of contact for the field audit, and be responsible for overseeing implementation of any corrective actions required or as requested by EPA. Field audit reports will be completed following each audit. This report is a CDM internal document and will be maintained in the RAC VIII project files in Denver; a copy of the audit report as well as any corrective action reports will be provided to EPA.

Field Duplicate Samples

Field duplicate samples are co-located soil samples that are collected by the field personnel, but the laboratory is unaware that the samples are duplicates. These samples serve to evaluate the precision of both the field sampling and the laboratory's sample preparation and analysis. A field duplicate should be collected at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a field duplicate is a relative percent difference (RPD) less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit.

Field Equipment Blanks and Rinsate Samples

Field equipment blanks and rinsates samples are collected to determine if decontamination procedures of field equipment used to collect asbestos samples are adequate to prevent cross-contamination of samples during sample collection. Field equipment blanks will be collected at the end of each day from equipment used by different field teams to collect soil samples for asbestos analysis. These samples will be collected using silica sand that is asbestos free as analyzed by IR. Field equipment blanks will be collected by placing silica sand in a decontaminated mixing bowl used to homogenize samples. The silica sand will be mixed in the bowl using decontaminated equipment that was used to collect soil samples. The silica sand will then be submitted as a sample for analytical analysis. Field equipment blanks will be submitted with paired aqueous rinsate samples during the first week of sample collection, the week during the middle of the field investigation (on or about the week of August 12th), and during the last week of the field investigation (on or about the week of October 28th). Aqueous rinsate samples will be collected at the same rate (one per day) as the field equipment blanks during the 3 weeks they are collected. The aqueous samples will be collected from the same equipment the field equipment blank is collected from. The field equipment blank will be collected before the aqueous rinsate sample is collected. The frequency of field equipment blank and rinsate sample collection may be adjusted, as the relationship between cross-contamination and sample results is understood. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2. Results will only be qualified if the amount detected in the rinsate or field equipment blank is at or above the reporting limit of the soil samples (0.1 percent by weight).

Preparation Duplicate Samples

Preparation duplicate samples are splits of samples submitted for sample preparation prior to laboratory analysis. These samples serve to evaluate the precision of both the sample preparation personnel and the laboratory's sample preparation and analysis. A preparation duplicate sample should be submitted at a frequency of 5 percent of the first 500 field samples prepared for analysis or one per preparation batch, whichever is more frequent. The acceptable criteria for a preparation duplicate is an RPD less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit. If the average RPD for the first 500 samples is 50 percent, preparation duplicate sample analysis will not continue. If the average RPD for the first 500 samples is >50 percent, preparation duplicate sample analysis will continue at a rate of 2 percent for the remainder of the project. The frequency of the submission of preparation duplicate samples may be further reduced as initial information about the homogeneity of samples is understood. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2.

Preparation Laboratory Equipment Blanks

Laboratory equipment blank samples are collected to determine if decontamination procedures of laboratory equipment used to prepare asbestos samples are adequate to prevent cross-contamination of samples during sample preparation. Laboratory equipment blanks will be collected at the end of each day of sample preparation from equipment used to prepare samples for asbestos analysis. These samples will be collected using silica sand that is asbestos free as analyzed by IR. Silica sand will be prepared the same way a soil sample submitted from the field is prepared for analysis by the preparation laboratory. The silica sand will then be submitted as a sample for analytical analysis. The frequency of laboratory equipment blank sample collection may be adjusted, as the relationship between cross-contamination and sample results is understood. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2.

Data Entry Checks

Data entry into the Libby project database is performed by the Volpe Center with a 100 percent QC of the data. CDM will perform an additional 10 percent QC on all data entered into the database by comparing field data sheets, survey forms, COCs, and analytical data. This check will be performed on a daily basis on the data entered from the previous day.

7.1.1 Select Study Locations

Relevant property data (completed questionnaires and soil sample results) collected during the previous Phase I investigation will be evaluated to determine if sufficient information exists to satisfy the DQOs (Section 3). Soil samples collected from these properties during Phase I activities were analyzed by PLM and then archived. The archived sample will be submitted for additional analysis as described in Section 4.3.4. The potential problems and corrective actions associated with selecting study locations are presented below.

Potential Problem	QA/QC Measure	Corrective Action
Screen Previous Data		
Inaccurate data obtained in screen of previously collected data	Volpe Center database checks Field team review	Notify Volpe Center of incorrect information.
Study Area Grid		
Misidentification of study grid area	Field team orientation	Reorientation of study area grid divisions.
	Field form completion checks	Reorientation of study area grid divisions, and field form completion procedures. Correct and resubmit any field forms to Volpe Center for revised data entry.
	GIS map creation	Reorientation of study area grid divisions and field form completion procedures. Correct and resubmit any field forms to Volpe Center for revised data entry.

7.1.2 Public Awareness and Reconnaissance

Communicating information to the public regarding the CSS investigation is invaluable to its success. Communication will include community relations and sampling reconnaissance. No QA/QC measures have been developed for community relations; however, these measure do exist for sampling reconnaissance. The potential problems and corrective actions associated with public awareness and reconnaissance are presented below.

Potential Problem	QA/QC Measure	Corrective Action
Reconnaissance Team		
Incorrect completion of access agreements	Reconnaissance team orientation	Reorientation of access agreement completion procedures.
	Field form completion checks	Reorientation of access agreement completion procedures. Correction of errors on access agreement.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Misinforming residents and/or owners of the CSS study process	Reconnaissance team orientation	Reorientation of CSS study process.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.

7.1.3 Field Screening and Sampling

The field screening process at each property will consist of both a qualitative (i.e., verbal interview and visual inspection) and quantitative (i.e., soil sampling) approach. The potential problems, QA/QC measures implemented, and corrective actions for each approach are presented below.

Potential Problem	QA/QC Measure	Corrective Action
Visual Inspection		
Incorrect completion of field form (IFF) from visual inspection	Field team orientation	Reorientation of IFF and primary source identification procedures.
■ Presence or absence of Libby vermiculite attic insulation ■ Presence or absence of outdoor sources ■ Structure sketch ■ Property sketch	Field form completion checks	Reorientation of IFF and primary source identification procedures and additional checks of IFFs completed by the same team. Resubmit IFFs requiring correction to Volpe Center for revised data entry.
	Supplemental verification	Reorientation of primary source identification and additional screening field checks of

Potential Problem	QA/QC Measure	Corrective Action
		inspections completed by the same team. Resubmit IFFs requiring correction to Volpe Center for revised data entry.
	Screening field checks	Reorientation of primary source identification and additional screening field checks of inspections completed by the same team. Resubmit IFFs requiring correction to Volpe Center for revised data entry.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Incorrect identification of primary sources	Field team orientation	Reorientation of primary source identification
	Field form completion checks	Reorientation of primary source identification and additional screening field checks of inspections completed by the same team. Resubmit affected paperwork requiring correction to Volpe Center for revised data entry.
	Supplemental verification	Reorientation of primary source identification and additional screening field checks of inspections completed by the same team. Resubmit affected paperwork requiring correction to Volpe Center for revised data entry.
	Screening field checks	Reorientation of primary source identification and additional screening field checks of inspections completed by the same team. Resubmit affected paperwork requiring correction to Volpe Center for revised data entry.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Verbal Interview		
Incorrect completion of field form (IFF) from verbal interview	Field team orientation	Reorientation of IFF and interview procedures.
	Field form completion checks	Reorientation of IFF completion procedures and additional checks of IFFs completed by the same team. Resubmit IFFs requiring correction to Volpe Center for revised data entry.

Potential Problem	QA/QC Measure	Corrective Action
	Screening field checks	Reorientation of IFF completion procedures and additional checks of IFFs completed by the same team. Resubmit IFFs requiring correction to Volpe Center for revised data entry.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Soil Sampling		
Incorrect completion of field form (FSDS) for sample collection	Field team orientation	Reorientation of FSDS completion procedures.
	Field form completion checks	Reorientation of FSDS completion procedures and additional checks of FSDSs completed by the same team. Resubmit FSDSs requiring correction to Volpe Center for revised data entry.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Incorrect completion of field logbook	Field team orientation	Reorientation of field logbook completion procedures.
	Field form completion checks	Reorientation of logbook completion procedures and additional checks of logbooks completed by the same team.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Incorrect completion of COC	Field team orientation	Reorientation of COC completion procedures.
	Field form completion checks	Reorientation of COC completion procedures and additional checks on COCs completed by the same team. Resubmit COCs requiring correction to Volpe Center for revised data entry and contact laboratory by fax or e-mail (to document the problem) and issue revised COC.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Incorrect documentation of changes to study process	Screening field checks	Review process for documentation of changes to the study process, and complete required documentation.
	Field audit to assess compliance of this study step with the SAP	Implement corrective actions of field audit.
Incorrect decontamination procedures	Field Team Orientation	Reorientation of decontamination procedures.

Potential Problem	QA/QC Measure	Corrective Action
	Field equipment blanks and rinsate samples Field audit to assess compliance of this study step with the SAP	Reorientation of decontamination procedures and qualification of data as described by data validation procedures. Implement corrective actions of field audit.
Incorrect recording of GPS locations	Field team orientation Screening field checks Field audit to assess compliance of this study step with the SAP	Reorientation of GPS recording procedures. Reorientation of GPS recording procedures. Implement corrective actions of field audit.
Incorrect determination of sampling locations	Field team orientation Screening field checks Field audit to assess compliance of this study step with the SAP	Reorientation of sample location selection process. Reorientation of sample location selection process. Implement corrective actions of field audit.
Incorrect sample collection techniques	Field team orientation Field equipment blanks and rinsate samples Field duplicates Preparation duplicates and laboratory equipment blank samples Field audit to assess compliance of this study step with the SAP	Reorientation of sample collection procedures. Reorientation of decontamination procedures and qualification of data as described by data validation procedures. Reorientation of sample collection procedures and qualification of data as described by data validation procedures. Discussion with preparation laboratory regarding procedure. If RPD continues to be above 35 percent or consistent problems with the equipment blank occur, a laboratory audit may be performed. Implement corrective actions of field audit.
Incorrect packaging and COC during shipment of samples	Field team orientation Field audit to assess compliance of this study step with the SAP	Reorientation of COC procedures. Implement corrective actions of field audit.
Inadequate sample preparation procedures	Preparation duplicates and laboratory equipment blank samples	Discussion with preparation laboratory regarding procedure. If RPD continues to be above 35 percent, a laboratory audit may be performed.

Potential Problem	QA/QC Measure	Corrective Action
Incorrect information entered into the database	Data entry checks	Notify the Volpe Center of errors and perform additional checks on data entered.

7.1.4 Sample Analysis and Data Validation

Soil samples will be analyzed for LA by the IR method (ISSI-LIBBY-02). Depending on sample results, a sample split may be submitted for analysis using the SEM method (Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy, Revision 0, May 6, 2002). Once the CSS investigation has been completed for a specific property, the CIC will mail the owner a follow-up letter detailing the results of the investigation and additional information regarding any necessary further activities. The data validation process will follow the procedures outlined in the site specific SOP for Data Validation of Asbestos Results Obtained by Reflectance Spectroscopy and Scanning Electron Microscopy (Appendix C).

The QA/QC measures associated with this CSS study process step are discussed below followed by a detail of the potential problems with this study step, the QA/QC measures designed to mitigate the problems, and the corrective actions to prevent reoccurrence of problems.

Current precision and accuracy goals for bulk soil analysis of LA by IR and SEM are untested and therefore unavailable. Frequency of QC sample collection and analytical precision and accuracy criteria provided here are take from more standard inorganic EPA methods. We recognize that these goals may require adjustment as data are generated for the methods used at Libby. Precision and accuracy criteria will be derived for method-specific and Libby site soils using control charting and standard procedures outlined in SW-846. Further, recommended frequencies for the QC samples prescribed here may be adjusted as we gain information about the variability of samples at Libby.

Precision

The precision of a measurement is an expression of the mutual agreement among individual measurements of the same property taken under prescribed similar conditions. Precision is quantitative and most often expressed in terms of RPD. Comparing the analytical results of the laboratory duplicate sample and its parent sample can assess precision of laboratory analysis. The RPD can be calculated for each pair of duplicate analyses using the following equation:

$$RPD = |S-D| / [(S+D)/2] \times 100$$

Where:

S = First sample value (original value)

D = Second sample value (duplicate value)

Precision of reported results is a function of inherent field-related variability plus laboratory analytical variability, depending on the type of QC samples. Laboratory duplicates will be used evaluate the variability in laboratory preparation. Field duplicate samples and preparation duplicate samples will be collected to provide a measure of the contribution to overall variability of field-related sources. Laboratory duplicate samples, IR/SEM split samples, and laboratory split samples will be used to provide a measure of the contribution to overall variability of field-related sources. Acceptable RPD limits for laboratory duplicates, IR/SEM split samples, laboratory split samples, field duplicates, and preparation duplicate measurements are included in Table 7-1. In addition, all original sample results and their respective duplicates will be presented graphically and linear regression performed on a weekly basis.

Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value and is a measurement of the bias in a system. Analytical data will be evaluated for accuracy using laboratory control samples (LCS) and PE samples. Accuracy criteria are listed in Table 7-1.

Representativeness

Representativeness expresses the degree to which sample data represent:

- The characteristic being measured
- Parameter variations at the sampling point
- An environmental condition

Representativeness is a qualitative parameter that is most concerned with the proper design of the sample plan and sampling procedures and the absence of sample contamination. Acceptable representativeness will be achieved through careful, informed selection of sampling sites; selection of testing parameters and methods that adequately define and characterize the extent of possible contamination and meet the required parameter reporting limits; proper collection and handling of samples to avoid interferences and prevent contamination and loss; and collection of a sufficient number of samples to allow characterization. Representativeness is a consideration that will be employed during all sample location and collection efforts.

The representativeness can be assessed qualitatively by reviewing the procedures and design of the sampling event and quantitatively by reviewing the laboratory blank samples. If an analyte is detected in a laboratory blank, any associated positive result less than five times the blank result may be considered undetected, or may require confirmation by an alternate method of at least equal sensitivity.

Sensitivity

The achievement of method detection limits (MDLs) depends on instrument sensitivity and matrix effects. Therefore, it is important for the laboratory to monitor the sensitivity of data-gathering instruments to ensure the data quality through constant instrument performance. The laboratory, through the analysis of preparation blanks, will monitor instrument sensitivity. In addition, laboratories must perform MDL studies on the IR in accord with 40CFR Part 136. CDM will evaluate sensitivity during the entire project by ensuring that reporting limits are below acceptable criteria. Reporting limits are 0.1 percent for IR and SEM and 10 grid openings for rinsate waters by ISO 10312.

SEM/IR

For the first 500 samples collected and analyzed by IR, 20 percent of samples with IR results less than or equal to 0.5 percent will be sent for SEM analysis and 10 percent of samples with IR results greater than 0.5 percent but less than or equal to 1 percent will be sent for SEM analysis. CDM and the RPM will use this information to determine what frequency the SEM/IR splits should continue. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2.

Laboratory Splits

Laboratory split samples will also be analyzed to determine variability of sample analysis between laboratories. In this case, the same samples will be analyzed by different laboratories using the same analytical technique. Laboratory split samples will be analyzed at a frequency of 2 percent of samples collected. This frequency will be continued for the duration of the CSS. After the first 4 weeks of sampling, a linear regression will be performed on the data and an average RPD calculated. These calculations will be updated on a weekly basis after the initial 4 weeks and submitted to the RPM to be evaluated for laboratory performance issues. If the required frequency is adjusted, the change and supporting rationale will be documented as described in Section 5.2.2.

Laboratory Duplicates

Laboratory duplicate samples are splits of a well-homogenized sample that is prepared by the laboratory personnel. Because the laboratory is aware that the samples are duplicates, these samples serve to evaluate the precision of the laboratory's sample preparation and analysis. A laboratory duplicate should be performed at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a laboratory duplicate is an RPD less than or equal to 35 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than two times the reporting limit when either sample result is <5 times the reporting limit.

Method Blanks

An instrument blank is composed of the field sample matrix that is free of the analyte of interest (e.g., asbestos-free soil). Method blanks are put through the same sample preparation steps as field samples and are used to discern if laboratory-induced contamination is present. All associated samples may require re-preparation and re-analysis. Method blanks must be analyzed with each analytical batch or once a day, whichever is more frequent. An analytical batch is comprised of 20 field samples.

Laboratory Control Samples (LCS)

Laboratory control samples are certified reference standards (independent from the calibration standards), consisting of several asbestos minerals. Because LCSs are independent of the calibration standards, they are analyzed to verify the accuracy of the standards used to calibrate the instrument. An LCS must be analyzed with each analytical batch or once a day, whichever is more frequent. The LCS will be evaluated on two parameters and it must meet the acceptance criteria for both to be considered acceptable. These parameters are: (1) accurate asbestos minerals identification and (2) accurate fiber counting and sizing. The acceptable percent recovery (%R) for continuing calibration criteria is between 80 and 120%R.

Instrument Calibration

Calibration of laboratory instruments will be based on written procedures approved by laboratory management and included in the laboratory QC manual. Instruments and equipment will be initially calibrated and continually calibrated at required intervals as specified by either the manufacturer or more updated requirements (e.g., methodology requirements). Martix-matched calibration standards are not currently available by typical resources. However, instrument calibration must be verified using certified standards (that are not necessarily in a soil matrix), must be traceable to EPA, NIST, or another nationally-recognized reference standard source.

Records of initial calibration, continuing calibration, repair, and/or replacement of laboratory equipment will be filed and maintained by the laboratory. Calibration records will be filed and maintained at the laboratory location where the work is performed and are required to be included in data reporting packages.

Laboratory Training

A laboratory training program developed by the EPA will be implemented at the laboratories utilized to analyze samples for the CSS. The training will be for new analysts and new equipment.

Data Validation

CDM will validate data submitted by analytical laboratories according to the CDM Site-Specific SOP for Data Validation of Asbestos Results Obtained by Scanning Electron Microscopy for the Contaminant Screening Study of the Libby Asbestos Project; and the CDM Site-Specific SOP for Data Validation of Asbestos Results

Obtained by Reflectance Spectroscopy for the Contaminant Screening Study of the Libby Asbestos Project (provided in Appendix C). Data validation consists of examining the sample data packages against pre-determined standardized requirements. The validator may examine, as appropriate, the reported results, QC summaries, case narratives, COC information, raw data, LCSs, initial and continuing calibration criteria, and other reported information to determine the accuracy and completeness of the data package. During this process, the validator will verify that the analytical methodologies were followed and QC requirements were met. Table 7-1 describes the guidelines to be followed for validation of the data. All data qualified as estimated (J or UJ) are usable for decision-making purposes. As initial data are received, it may be appropriate to include a qualification process that indicates whether the J qualifier results in a high or low bias. Results qualified as unusable (R) should not be used for decision-making purposes.

Data validation will occur on 100 percent of data collected for the first 1,000 samples collected. If during the initial validation process the percentage of unusable data is greater than 5 percent for any five consecutive data packages received from the same laboratory, the data validator will notify the laboratory coordinator. The laboratory coordinator will contact the laboratory to determine and correct the problem. Data validation will continue at 100 percent for the particular laboratory until the percentage of unusable data is less than 5 percent for five consecutive data packages.

Following the initial 100 percent validation, the rate of validation will be decreased to 10 percent of samples per data package. If during the validation process the percentage of unusable data is greater than 2 percent for any five consecutive data packages received from the same laboratory, the data validator will notify the laboratory coordinator. The laboratory coordinator will contact the laboratory to determine and correct the problem. Data validation will continue at 20 percent for the particular laboratory until the percentage of unusable data is less than 2 percent for five consecutive data packages.

Data verification includes checking that results have been transferred correctly from laboratory data printouts to the laboratory report and to the EDD.

Laboratory Audits

Laboratories utilized to analyze samples collected as part of the CSS will be required to provide proof of current certifications. Examples of certifications include the following: American Industrial Hygiene Association and National Voluntary Laboratory Accreditation Program. If laboratory QC controls show consistent problems in the data validation process, a laboratory audit may be performed.

Data Entry Checks

Data entry into the Libby project database is performed by the Volpe Center with a 100 percent QC of the data. CDM will perform an additional 10 percent QC on all data entered into the database by comparing field data sheets, survey forms, COCs, and analytical data. This check will be performed on a daily basis on the data entered from the previous day.

CDM Document Review Process

All project deliverables will receive technical and QA reviews prior to being issued to EPA. These reviews will be conducted in accordance with CDM's Quality Procedure (QP) 3.2 Technical Document Review and QP 3.3 Quality Assurance Review (CDM 1997). Completed review forms will be maintained in the project files. The potential problems and corrective actions associated with SEM/IR splits are presented below.

Potential Problem	QA/QC Measure	Corrective Action
Unusable or inaccurate/imprecise data	Data Validation of the following parameters: ■ SEM/IR splits to determine precision and accuracy ■ Laboratory splits to determine precision and accuracy ■ Laboratory duplicates to determine precision ■ Field duplicates to determine precision ■ Preparation duplicates to determine precision ■ Laboratory blanks to determine representativeness ■ LCS to determine precision and accuracy ■ Instrument calibration to determine precision, accuracy, and representativeness In addition, the following QA/QC measures will be implemented: ■ Laboratory training ■ Laboratory audits	Data will be qualified according to data validation criteria. Identify and correct problem resulting in unusable data. If consistent problems are found, a laboratory audit may be performed.
Incorrect analytical results and qualifiers entered into the database	Data entry checks	Notify the Volpe Center of errors and perform additional checks on data entered.
Incorrect identification of	SEM/IR splits	If SEM results are significantly

Potential Problem	QA/QC Measure	Corrective Action
actinolite/tremolite as fibrous asbestos when it is actually massive		lower than IR results, reevaluate split frequency or primary analytical .
Incorrect information in residential/owner followup letter	CDM document review process	Make corrections to document.

A summary of the frequency of the CDM QC sample submission is presented in Table 7-2.

Every reasonable attempt will be made to obtain a complete set of usable field measurements and analytical data. If a measurement cannot be obtained or is rejected for any reason, the CDM project manger and CDM QA staff will evaluate the effect of the missing data in a real-time manner such that appropriate corrective action procedures can be implemented.

7.2 Assessment and Oversight

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities. Assessment and oversight reports are discussed below.

7.2.1 Assessments and Response Actions

Performance assessments are quantitative checks on the quality of a measurement system and may be used for analytical work. System assessments are qualitative reviews of different aspects of project work to check on the use of appropriate QC measures and functioning of the QA system. When a project exceeds 1 year, an office system assessment is required.

Performance assessments for the laboratory may be accomplished by submitting reference material as blind reference (or performance evaluation) samples. These assessment samples are samples with known concentrations that are submitted to the laboratory without informing the laboratory of the known concentration. Samples will be provided to the laboratory for performance assessment upon request from the EPA RPM. Laboratory audits may also be conducted upon request from the EPA RPM. CDM will be responsible for tracking the quality of data received from laboratories by performing data validation. If during the data validation process consistent quality issues are discovered, CDM may recommend a laboratory audit be performed.

Response actions will be implemented on a case-by-case basis to correct quality problems. Minor response actions taken in the field to immediately correct a quality problem will be documented in the applicable logbook and verbally reported to the CDM project manager. For verbal reports, the CDM project manager will complete a communication log to document that response actions were relayed to him. The CDM project manager and the EPA RPM will approve major response actions taken in the field prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation. Quality problems that cannot be corrected quickly through routine procedures (i.e., those resulting from an audit or those that signify and adjustment to the planning documents resulting from the audit) require implementation of a Corrective Action Request (CAR) Form. Corrective action forms will be implemented in accordance with CDM's QP 8.1, Correction Action (CDM 1997).

All formal response actions will be submitted to either CDM's RAC Region VIII QA specialist or RAC regional QA coordinator for review and issuance. CDM's project manager or project QA coordinator will notify the QA manger or regional QA coordinator when quality problems arise that may require a formal response action.

7.2.2 Reports to Management

QA reports will be provided to management whenever quality problems are encountered. Field staff will note any quality problems in the field logbooks. CDM's project manager will inform the project QA coordinator upon encountering quality issues that cannot be immediately corrected. Monthly QA reports will be submitted to CDM's RAC Region VIII QA manager by the local QA coordinator and the RAC regional QA coordinator. Topics to be summarized regularly may include but not be limited to: technical and QA reviews that have been conducted, activities and general program status, project meetings, corrective action activities, any unresolved problems, assessment of data deficiencies, and any significant QA/QC problems not included above.

7.3 Reconciliation with Data Quality Objectives

Once data has been generated, CDM will evaluate that analytical data for data quality assessment and adherence to the DQOs.

Table 7-1 Data Evaluation and Validation Criteria

Parameter (Methods)	Technical Holding Time	Calibration Initial	Calibration Continuing	Blanks	LCS	Laboratory Duplicate	SEM/IR Split	Laboratory Split	Field Duplicate	Preparation Duplicate
Asbestos SEM	None	Magnification = +/- 10% Peak Centroid = Al = 1.487 (+/- 0.05) KeV Cu = 8.047 (+/- 0.05) KeV Resolution = <175 eV Sodium Sensitivity = ?	80-120%	Results < 5 x blank contamination	80-120%	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: < 50% If either result < 5 x CRDL: Solid Media: Difference < 4 x CRDL	If both results >5 x CRDL: RPD Solid Media: < 50% If either result < 5 x CRDL: Solid Media: Difference < 4 x CRDL
Asbestos IR	None	Required frequency met	80-120%	Results < 5 x blank contamination	80-120%	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: <35% If either result <5 x CRDL Solid Media: Difference <2 x CRDL	If both results >5 x CRDL: RPD Solid Media: < 50% If either result < 5 x CRDL: Solid Media: Difference < 4 x CRDL	If both results >5 x CRDL: RPD Solid Media: < 50% If either result < 5 x CRDL: Solid Media: Difference < 4 x CRDL

NA = not applicable

CRDL = contract required detection limit

IDL = instrument detection limit

LCS = laboratory control sample

RPD = relative percent difference

KeV = kiloelectron volt

eV= electron volt

SEM = scanning electron microscopy

IR =reflectance spectroscopy

SEM and IR CRDL - 0.1%

Table 7-2 Frequency of Collection and Submission of CDM QC Samples

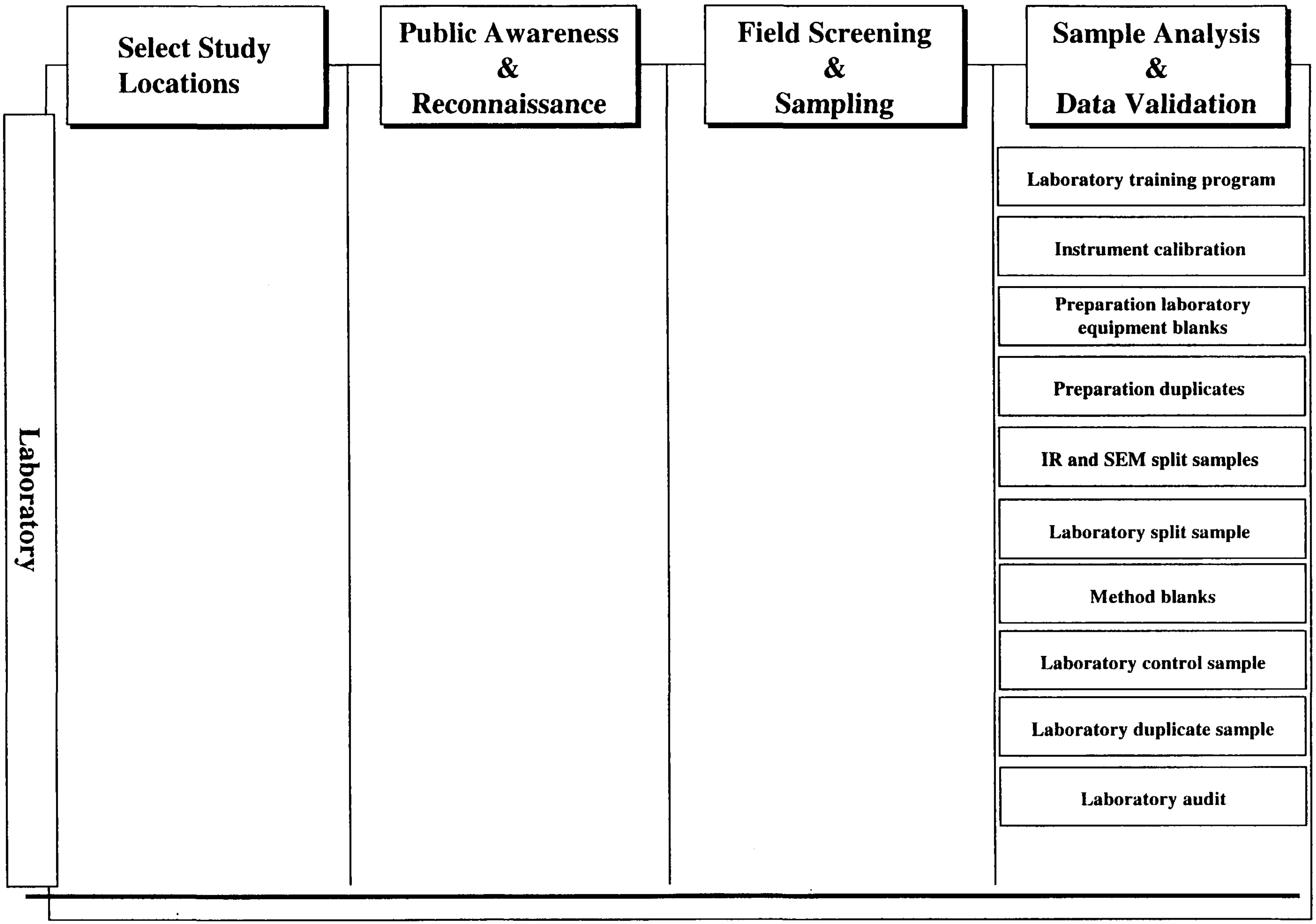
QC Sample Type	Collection Frequency	Personnel Responsible for Sample Collection and/or Submission to Laboratory
SEM/IR Splits	First 500 samples collected: 20% (1 in 5) of IR results ≤0.5% 10% (1 in 10) of IR results >0.5% and ≤1%	Laboratory Coordinator
	Following first 500 samples collected: TBD	TBD
Field Equipment Blank	One a day	Field Team/Sample Coordinator
Laboratory Splits	2% (1 in 50) per sample analysis type	Laboratory Coordinator
Field Duplicates	5% (1 in 20)	Field Team/Sample Coordinator
Preparation Duplicates	First 500 samples collected: 5% (1 in 20)	Preparation Laboratory/Sample Coordinator
	If average RPD of samples from first 500 = <50%: Preparation duplicate sample submission will not continue	NA
	If average RPD of samples from first 500 = <50%: 2% (1 in 50)	Preparation Laboratory/Sample Coordinator

This page intentionally left blank.

Figure 7-1: Quality Control Associated with Each Step of the CSS Process (Field)

	Select Study Locations	Public Awareness & Reconnaissance	Field Screening & Sampling	Sample Analysis & Data Validation
Field		Recon. Team orientation	Field Team orientation	Data validation
		Field audit	Screening field checks	Data entry quality control
		Field form completion check	Field duplicates of soils samples	CDM document review process
			Field equipment blanks	
			Rinsate samples	
			Field form completion checks	
			Supplemental verification	
			Field audit	

Figure 7-2: Quality Control Associated with Each Step of the CSS Process (Laboratory)



Section 8
References

ATSDR. 2001. Health Consultation, Libby Asbestos Site, Libby, Lincoln County, Montana. Mortality from Asbestosis in Libby, Montana, 1979 – 1998.

CDM. 1996a. RAC Region VIII Quality Assurance Project Plan. August.

_____. 1996b. RAC Region VIII Quality Management Plan. August.

_____. 1997. Quality Assurance Manual, Part Two, Revision 8. October.

_____. 2002. Original Work Plan for the Libby Asbestos Site, Operable Unit 4, Libby Asbestos Remedial Investigation Sampling and Analysis Plan and Supporting Activities, Libby, Montana. March.

_____. 2001. Technical Standard Operating Procedures Manual. Revision 14.

EPA. 2000a. Sampling and Quality Assurance Project Plan for Libby, Montana, Environmental Monitoring for Asbestos. Revision 1. January.

_____. 2000b. Guidance for the Data Quality Objectives Process, EPA QA/G-4. Final. August.

_____. 2000c. Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy. Revision 0. May 6, 2002.

_____. 2000d. Action Memorandum. Request for a Time Critical Removal Action Approval and Exemption from the 12-month, $2-million Statutory Limit at the Libby Asbestos Site-Export Plant & Screening Plant former Processing Areas, Libby Lincoln County, Montana. May 23, 2000.

_____. 2001a. Chris Weis Memorandum to Paul Peranard. Subject: Amphibole Mineral Fibers in Source Materials in Residential and Commercial Areas of Libby Pose an Imminent and Substantial Endangerment to Public Health. December 20, 2001.

_____. 2001b. EPA Requirements for Quality Assurance Project Plans, QA/R-5. Final. March.

_____. 2001c. Action Memorandum. Request for a Time Critical Removal Action Approval and Exemption from the 12-month, $2-million Statutory Limit Libby Vermiculite Mine, Libby, Montana – Transmittal Memo. August 13, 2001.

Leake, B.E., et al. 1997. Nomenclature of Amphiboles: Report of the Subcommittee on Amphiboles of the International Mineralogical Association, Commission on New Mineral and Mineral News. American Mineralogist: 82.

Natural Resource Conservation Service (NRCS). 1998. Soil Survey of the Kootenai National Forest Area. Soil Survey Staff. September.

NIOSH. 1994. Asbestos (bulk) by PLM. Method 9002, Issue 2. August.

Appendix A

SRC Technical Memorandums

<u>TECHNICAL MEMO 1</u>

Concordance Between Visible Vermiculite and the Occurrence of Asbestos by PLM in Soil and Soil-Like Media

<u>TECHNICAL MEMO 2</u>

Occurrence of Asbestos in Libby Vermiculite Insulation

<u>TECHNICAL MEMO 3</u>

Evaluation of the Need for Indoor Dust Sampling at Buildings in Libby Where Vermiculite Insulation is Present

TECHNICAL MEMO 1

CONCORDANCE BETWEEN VISIBLE VERMICULITE AND THE OCCURRENCE OF ASBESTOS BY PLM IN SOIL AND SOIL-LIKE MEDIA

1.0 INTRODUCTION

USEPA Region 8 is currently planning a large-scale investigation to identify potentially significant sources of asbestos in and about the community of Libby. Because of the cost and time required to perform a microscopic analysis of each potential source material, EPA wished to evaluate the reliability of the assumption that when visible vermiculite was present in a sample of soil-like media that asbestos would be observable by polarized light microscopy (PLM) in that sample. This technical memo summarizes the data bearing on that question.

2.0 APPROACH

A query of the Libby database was performed on 05/03/02. All samples of soil or soil-like media (this does not include insulation) were reviewed to determine if the word "vermiculite" occurred in the comment field. A query was designed to isolate those samples in which the comment indicated that vermiculite was visible by eye, and all such samples were then classified into four bins according to the results of an analysis for asbestos by PLM:

- No PLM results available
- Non-detected
- Trace (asbestos visible by PLM, but level is too low to provide a quantitative estimate)
- Quantifiable ($\geq$1% asbestos by mass)

The design of the query and the resulting output are provided as Attachment 1.

3.0 RESULTS

A total of 568 soil or soil-like samples were located in which the comment field indicated that visible vermiculite was present. Of these, PLM results were available for 567. These PLM results are summarized below:

PLM Result	Number of Samples	Percent of Total
Non-detect	145	26%
Trace	303	53%
Quantifable (≥ 1%)	119	21%

As see, 74% of the samples had detectable (trace or higher) levels of asbestos present, with 21% being above the quantitation limit (about 1%). This indicates that most samples with visible vermiculite also contain asbestos by PLM.

Samples of soil and soil-like media containing visible vermiculite have been collected from a wide variety of locations around the Libby site. In order to determine if the frequency of detectable asbestos in samples with visible vermiculite depends on the land use category, the samples were stratified into four bins, as shown in Table 1. As seen, the frequency of PLM-detectable asbestos in to soil samples is 70% or greater in all cases, supporting the conclusion that the association of asbestos with visible vermiculite is not a function of land use category.

In order to determine if these is any spatial pattern to the occurrence of vermiculite and asbestos in soil, several maps (Figure 1A, 1B, 1C, 1D) were prepared to show the location of soil samples that contained visible vermiculite[1], color-coded to indicate the results of the PLM analysis for asbestos (blue = ND, orange = trace, red = 1% or greater). As shown in Figure 1C, a majority of the samples that contained 1% asbestos were located at the screening plant. This is perhaps expected, since soil at this site was generally more heavily contaminated with vermiculite than at most other locations. In the residential and commercial area of Libby, but no clear pattern of occurrence of asbestos level was apparent.

4.0 CONCLUSION

Based on the high concordance between the occurrence of visible vermiculite in soil and soil-like media and the presence of detectable (trace or quantifiable) levels of asbestos fibers by PLM, it is concluded that the presence of visible vermiculite in soil at the Libby site is a reliable and useful indicator of the presence of elevated levels of asbestos.

[1] Not all locations with visible vermiculite in soil are shown in the maps, since coordinates are not availablr for all sampling locations.

Table 1. Summary of PLM Results for Soil and Soil-Like Media with Visible Vermiculite Present

PLM Result	Screening/Export		Schools		Residential/Commercial		Landfill	
	Number of Samples	Percent of Total	Number of Samples	Percent of Total	Number of Samples	Percent of Total	Number of Samples	Percent of Total
Non-detect	2	3%	5	19%	135	30%	3	21%
Trace(<1%)	18	25%	9	35%	265	58%	11	79%
Quantifable (≥ 1%)	52	72%	11	42%	56	12%	0	0%

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Libby, Montana

Locations of Soils With Visible Vermiculite

Figure 1A

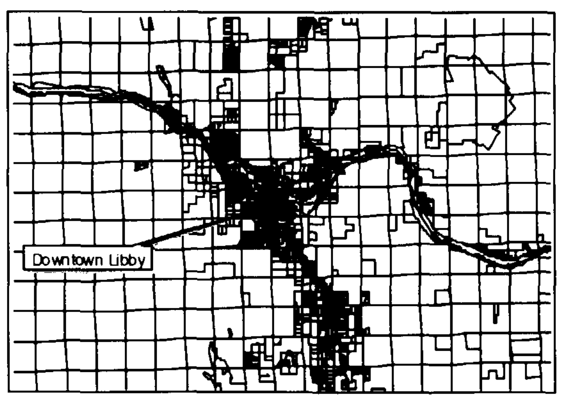
Asbestos Levels In Soil (by PLM)

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

□ Approximate Parcel Boundaries

LOCUS MAP



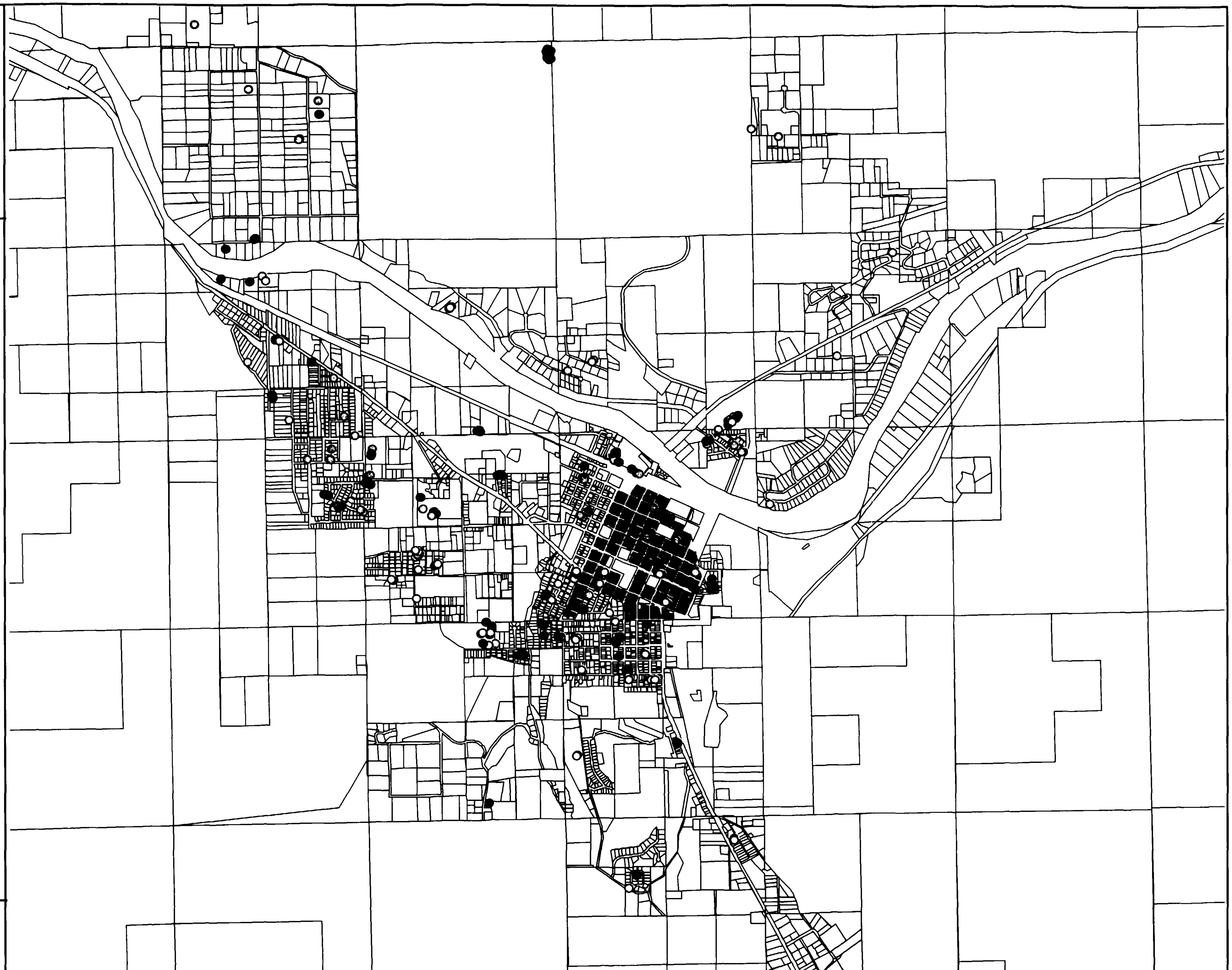
May, 2002

Map Projection UTM Zone 11 NAD83 FT

N
W E
S

CDM

2500 0 2500 Feet



Libby, Montana

Locations of Soils With Visible Vermiculite

Figure 1B

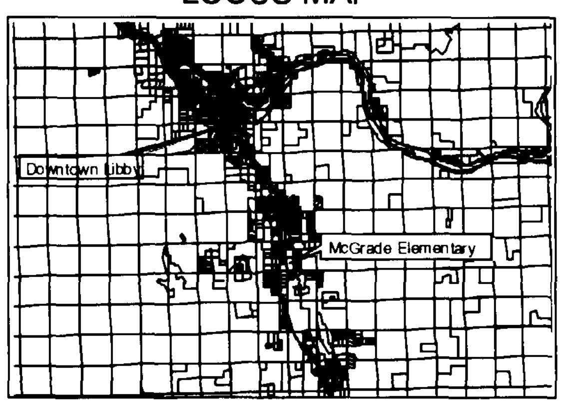
Asbestos Levels In Soil (by PLM)

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

☐ Approximate Parcel Boundaries

LOCUS MAP

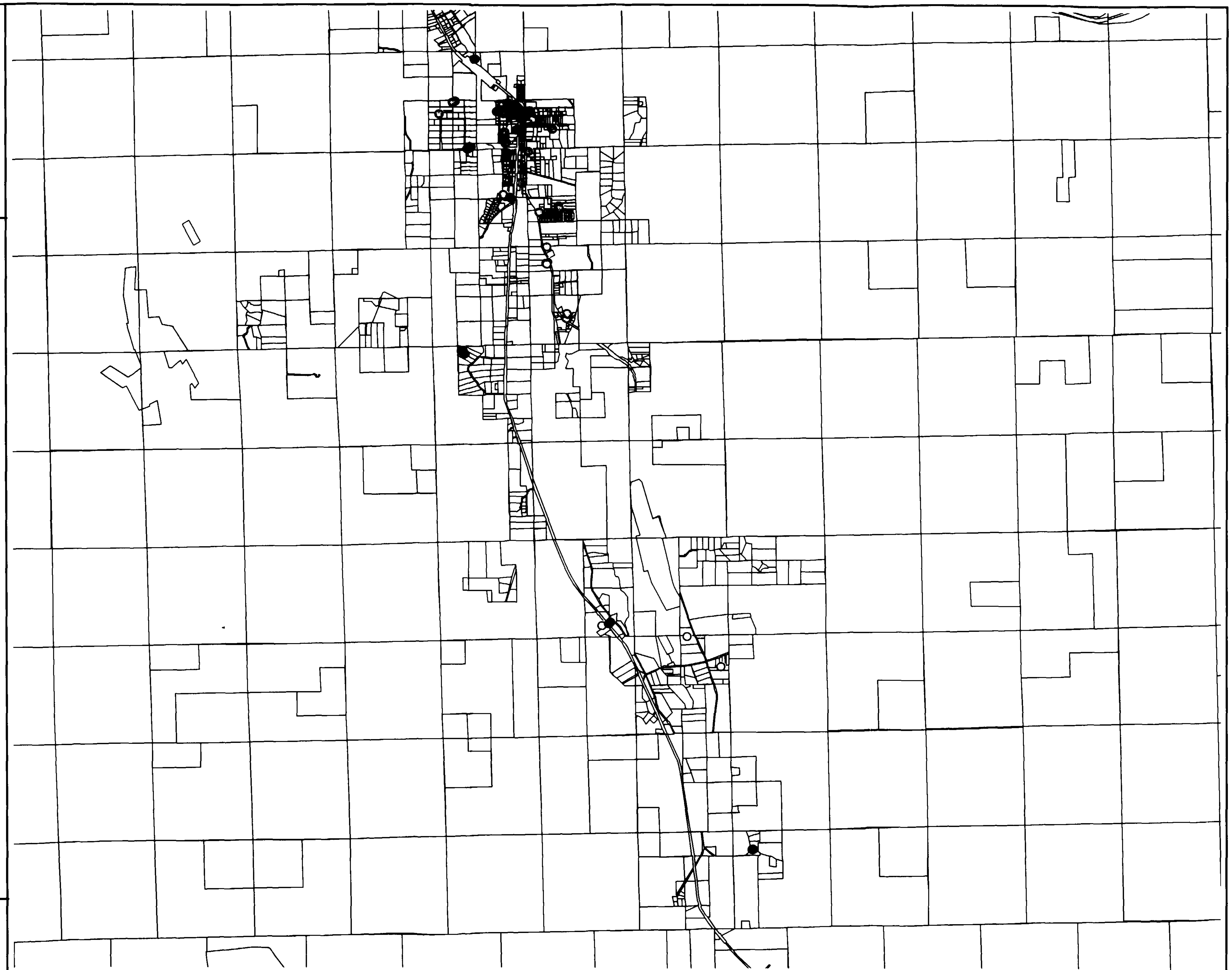


May, 2002

Map Projection UTM Zone 11 NAD83 FT

CDM

5000 0 5000 Feet



Libby, Montana

Locations of Soils With Visible Vermiculite

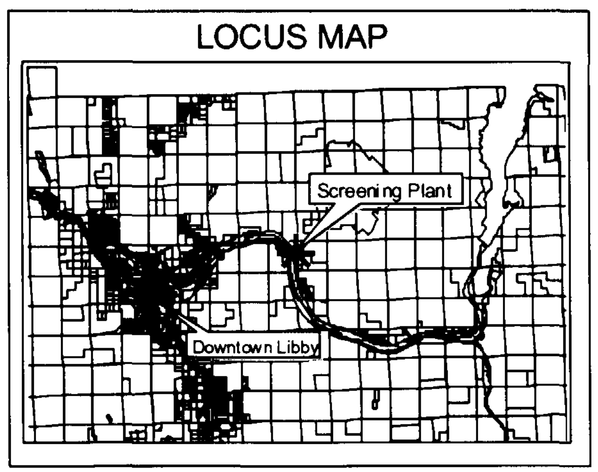
Figure 1C

Asbestos Levels In Soil (by PLM)

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

□ Approximate Parcel Boundaries



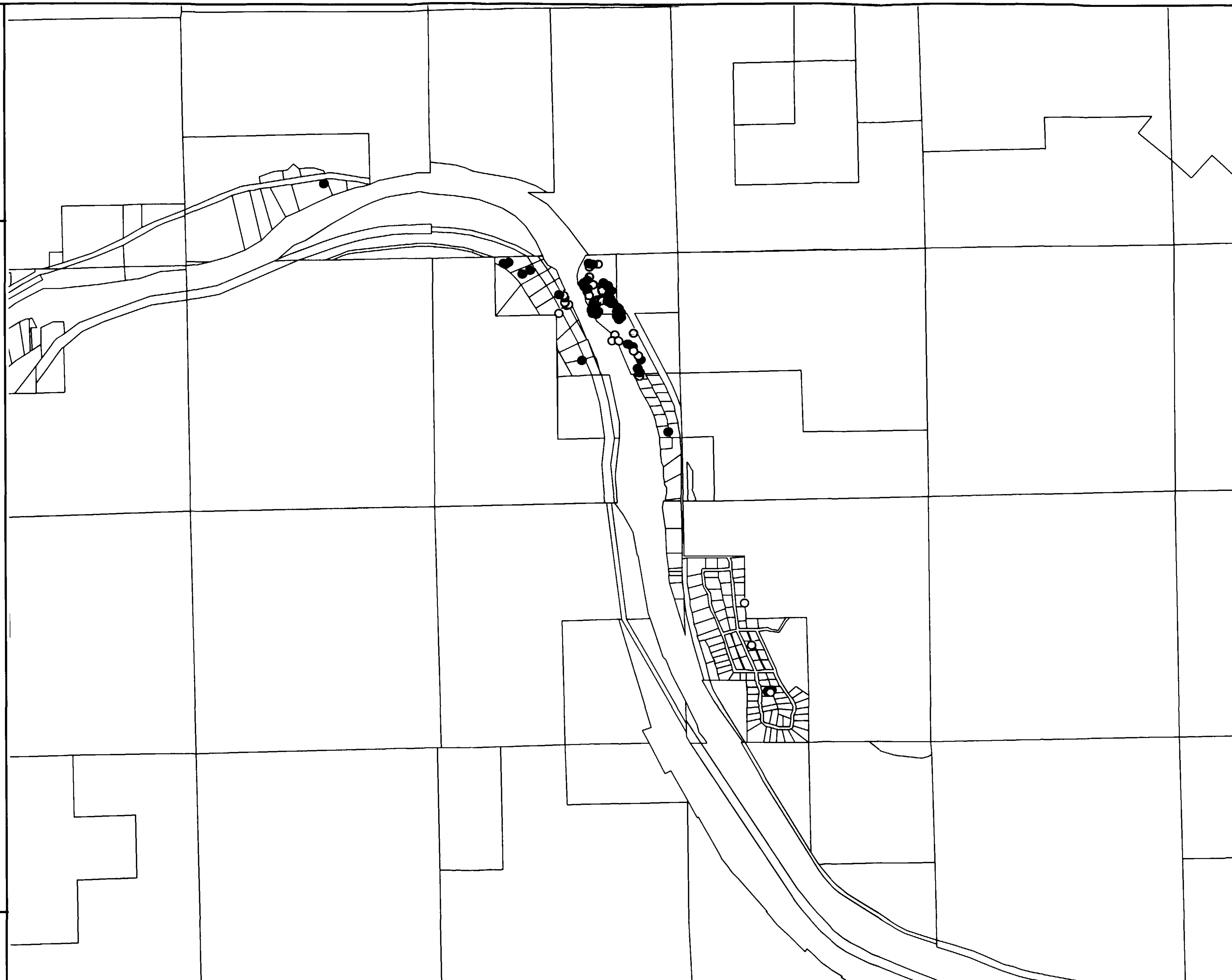
May, 2002

Map Projection UTM Zone 11 NAD83 FT

N W E S

CDM

2000 0 2000 Feet



Libby, Montana

Locations of Soils With Visible Vermiculite

Figure 1D

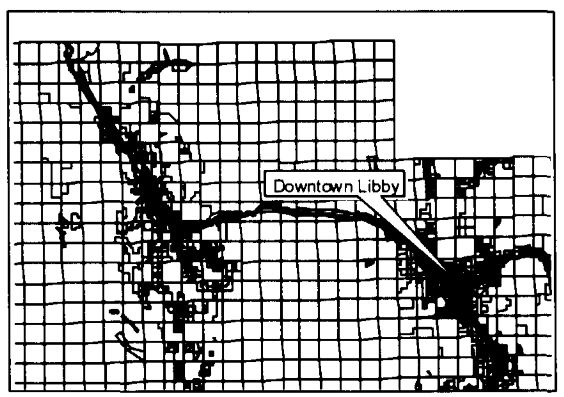
Asbestos Levels In Soil (by PLM)

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

☐ Approximate Parcel Boundaries

LOCUS MAP



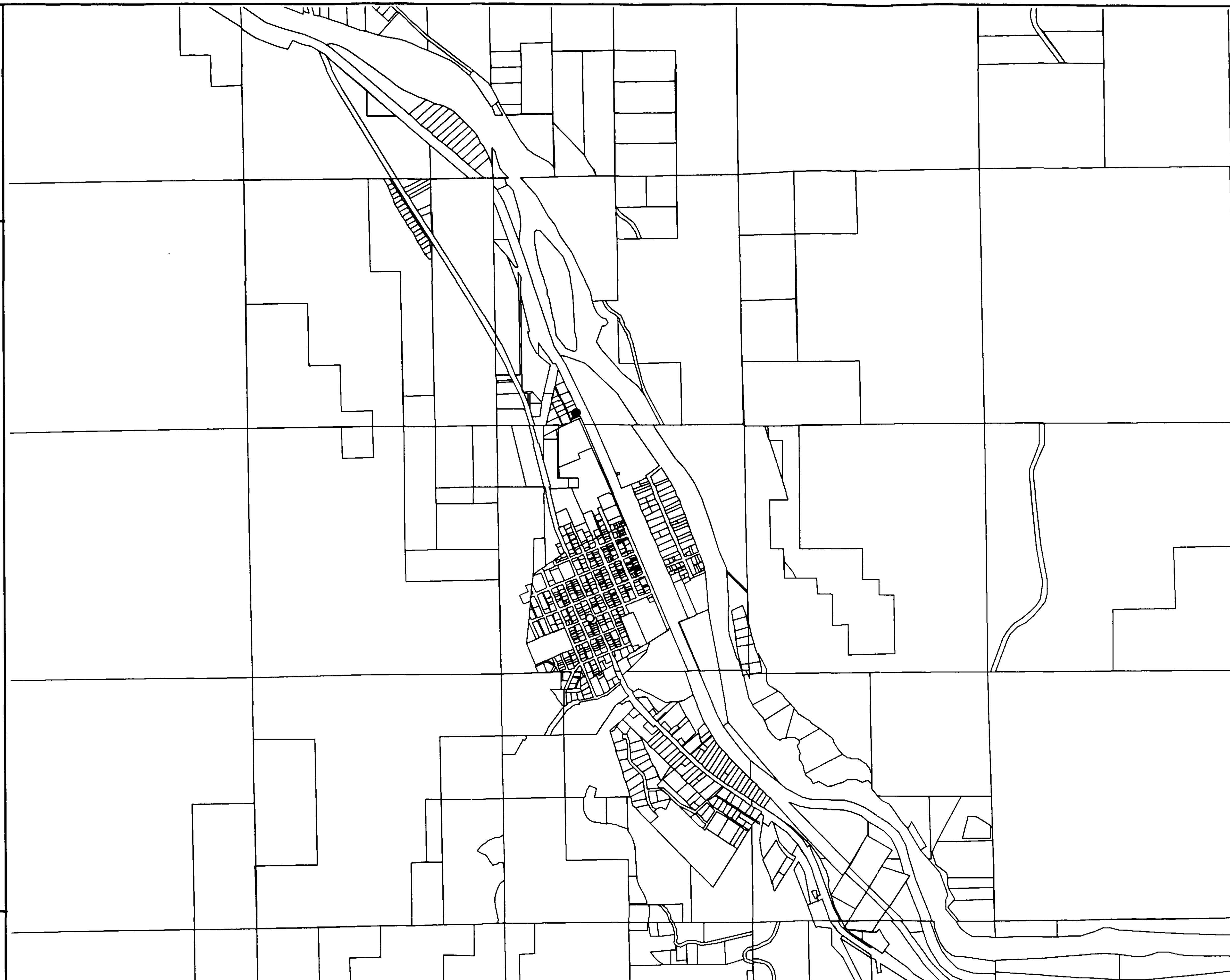
May, 2002

Map Projection UTM Zone 11 NAD83 FT

N W E S

CDM

2000 0 2000 Feet



TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 495637

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 04/01/2002

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ✓ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

ATTACHMENT 1 - Data (10 pages)

TECHNICAL MEMO 2

OCCURRENCE OF ASBESTOS IN LIBBY VERMICULITE INSULATION

1.0 INTRODUCTION

USEPA Region 8 is currently planning a large-scale investigation to identify potentially significant sources of asbestos in and about the community of Libby. Available data from the site support the conclusion that Libby vermiculite insulation (LVI) contains asbestos fibers, and that disturbance of the LVI can lead to release of asbestos fibers into air (Weis 2001a, 2001b). Thus, LVI is one of the sources of chief public health concern to EPA at the Libby site.

Because of the cost and time required to perform a microscopic analysis of each LVI sample, EPA wished to assess the reliability of the assumption that all samples of LVI should be considered a potential source of asbestos fibers. This technical memo summarizes the data bearing on that question.

2.0 APPROACH

A query of the Libby database was performed on 05/03/02 to isolate all samples that were classified as "insulation". These samples were classified into four bins according to the results of an analysis for asbestos by polarized light microscopy (PLM):

- No PLM results available
- Non-detected
- Trace (asbestos visible by PLM, but level is too low to provide a quantitative estimate)
- Quantifiable ($\geq$ 1% asbestos by mass)

The design of the query and the resulting output are provided as Attachment 1.

3.0 RESULTS

A total of 126 insulation samples were located. Of these, 125 had results of an analysis by PLM. These results are summarized below:

PLM Result	Number of Samples	Percent of Total
Non-detect	33	26%
Trace	84	67%
Quantifable (≥ 1%)	8	6%

As see, 74% of the insulation samples had detectable (trace or higher) levels of asbestos present, with 6% being above the quantitation limit.

In order to determine if there is any spatial pattern to the occurrence of LVI and the occurrence of detectable asbestos in the insulation, a series of maps (Figures 2A, 2B, 2C) were prepared to show the location of LVI samples that have been collected[1], color coded to indicate the results of the PLM analysis (blue- non-detect, orange = trace, red = 1% or higher). Inspection of these maps does not reveal any clear spatial pattern, either for the occurrence of LVI, or for the level of asbestos reported in the LVI.

4.0 CONCLUSION

Based on the high fraction of LVI samples from the Libby site that contain detectable levels of asbestos by PLM, coupled with the evidence that disturbance of LVI leads to the release of asbestos fibers into air (Weis 2001a, 2001b), it is concluded that it is reasonable and appropriate to assume that LVI at the Libby site is a probable source of asbestos fibers, and that individual analysis of each sample of LVI is not necessary or cost effective to make decisions regarding the potential risk from this material at this site.

5.0 REFERENCES

Weis, C.P. 2001a. Fibrous Amphibole Contamination in Soil and Dust at Multiple Locations in Libby Poses an Imminent and Substantial Endangerment to Public Health: an Addendum to my Memorandum of May 10, 2000. Memorandum from Christopher P. Weis, USEPA Regional Toxicologist, to Paul Peronard, USEPA On-Scene Coordinator for the Libby Asbestos Site. Dated 07/11/2001.

Weis, C.P. 2001b. Amphibole Mineral Fibers in Source Materials in Residential and Commercial Areas of Libby Pose an Imminent and Substantial Endangerment to Public Health. Memorandum from Christopher P. Weis, USEPA Regional Toxicologist, to Paul Peronard, USEPA On-Scene Coordinator for the Libby Asbestos Site. Dated 12/18/2001.

[1] Not all samples of LVI are shown on the maps because coordinate information is not available for all samples.

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Libby, Montana

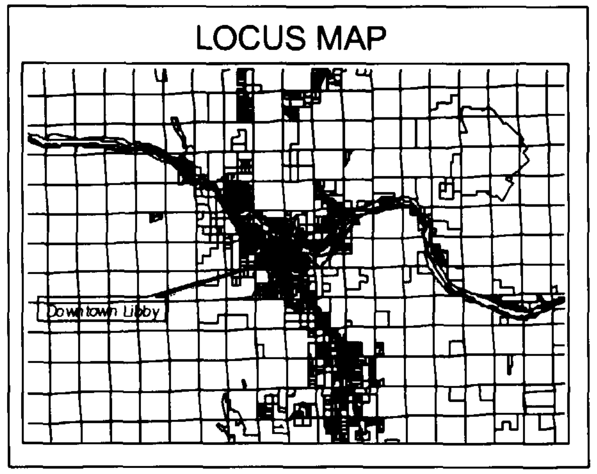
Locations of Buildings With Libby Vermiculite Insulation

Figure 2A

Soil Sample Results

- ● ND
- ○ TRACE
- ● $\geq 1\%$

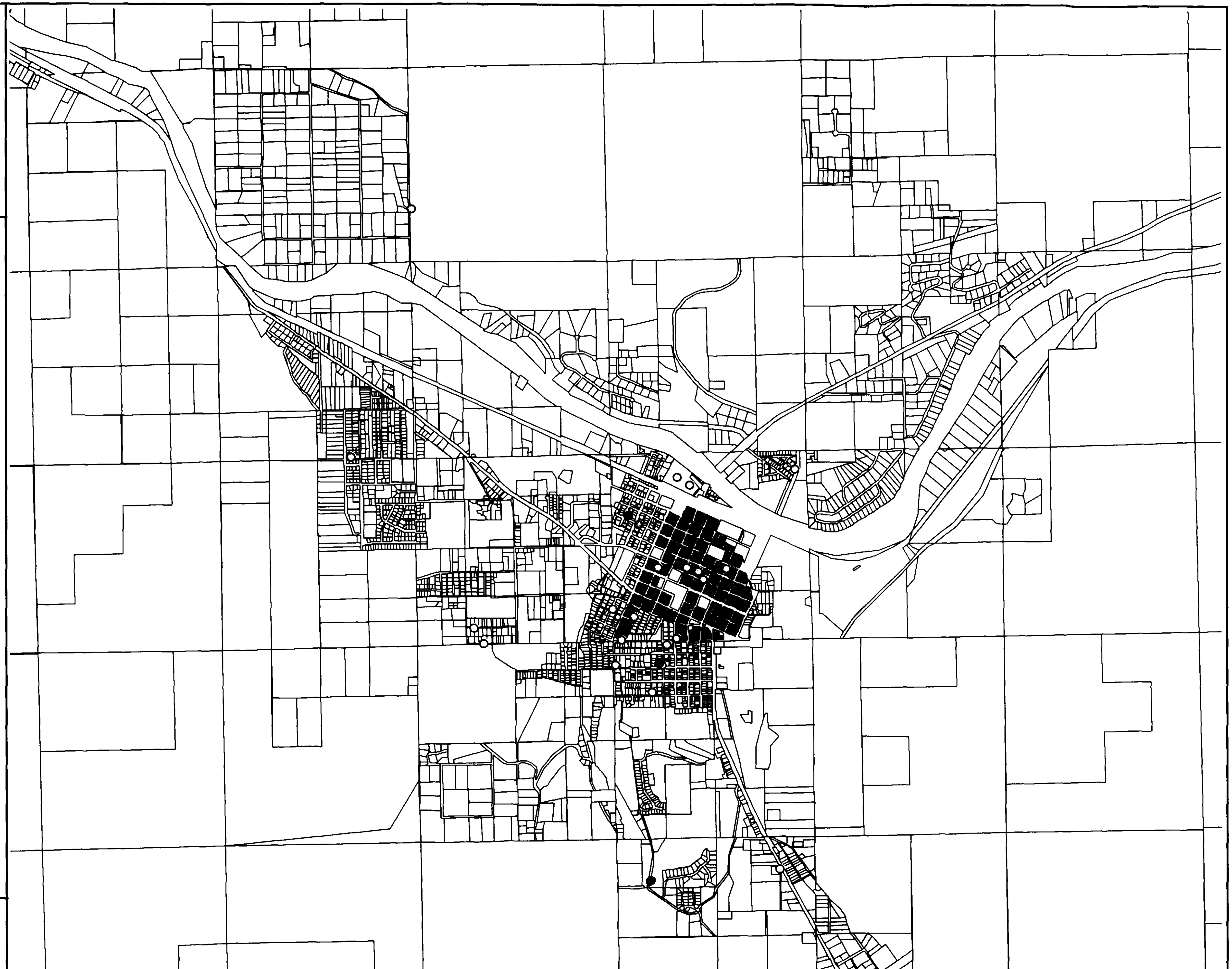
Approximate Parcel Boundaries



May, 2002

Map Projection UTM Zone 11 NAD83 FT

2500 0 2500 Feet



Libby, Montana

Locations of Buildings With Libby Vermiculite Insulation

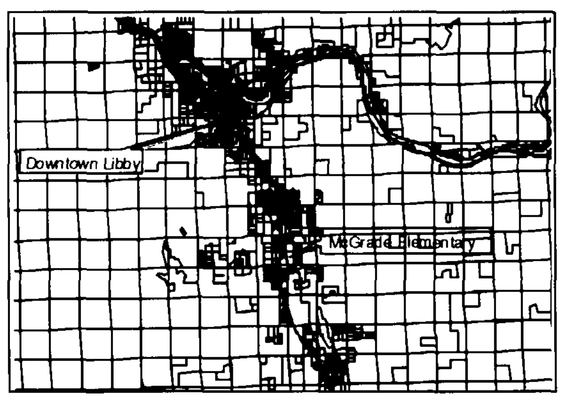
Figure 2B

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

□ Approximate Parcel Boundaries

LOCUS MAP

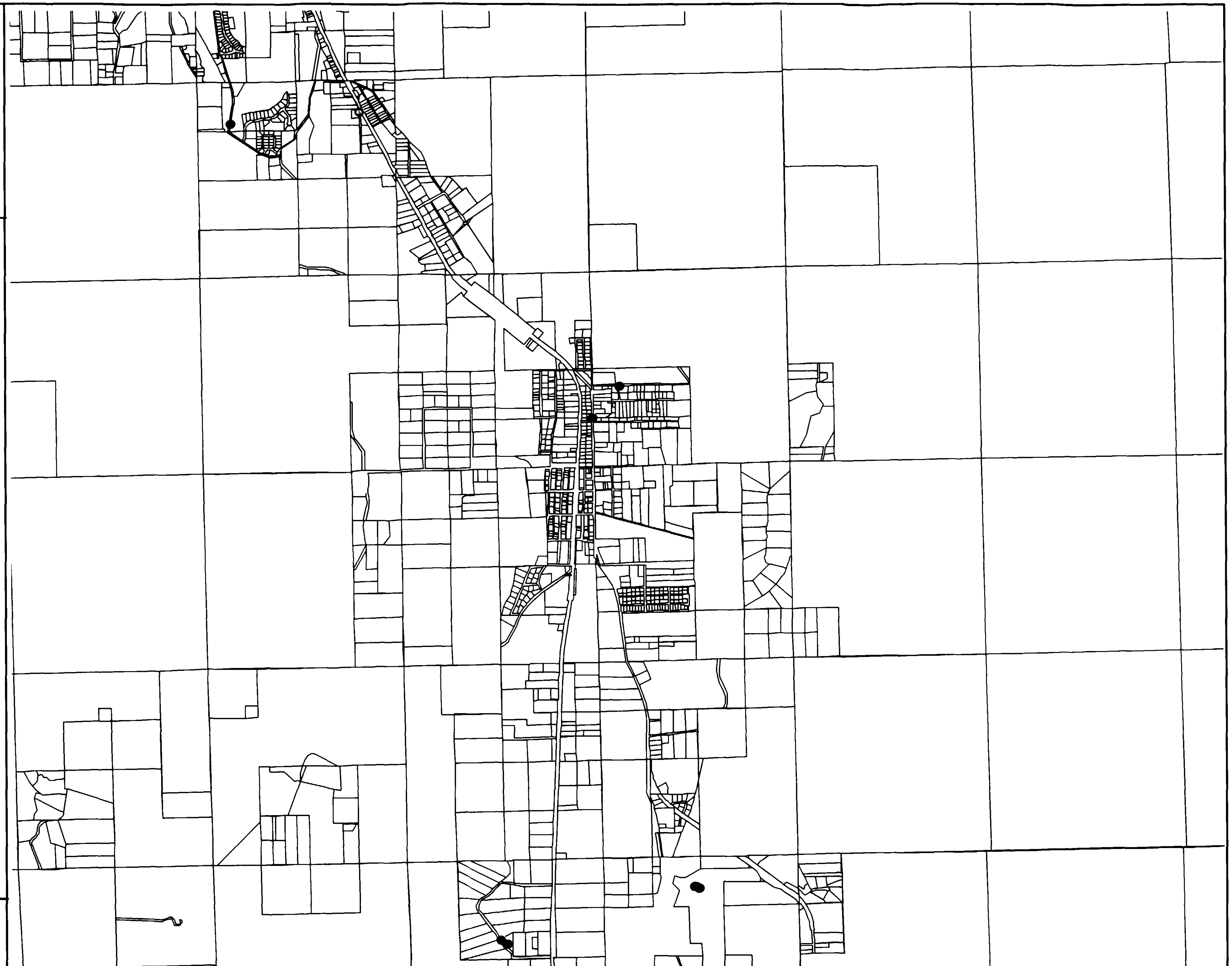


May, 2002

Map Projection UTM Zone 11 NAD83 FT

CDM

2500 0 2500 Feet



Libby, Montana

Locations of Buildings With Libby Vermiculite Insulation

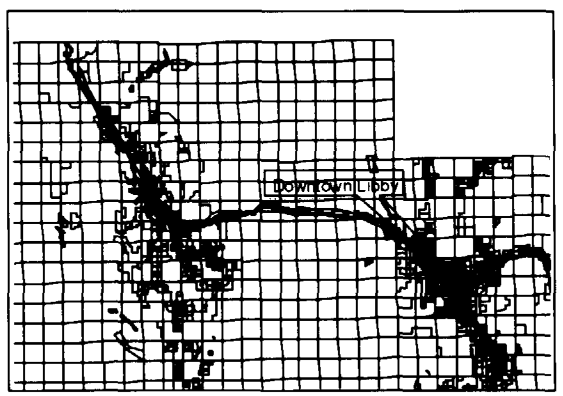
Figure 2C

Soil Sample Results

- ● ND
- ○ TRACE
- ● ≥1%

Approximate Parcel Boundaries

LOCUS MAP



May, 2002

Map Projection UTM Zone 11 NAD83 FT

1000 0 1000 Feet

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 495637

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 04/01/2002

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ✓ TYPES OF DOCUMENTS NOT TO BE SCANNED (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

ATTACHMENT 1 - Data (3 pages)

Contact the Superfund Records Center to view available document.
(303) 312-6473

TECHNICAL MEMO 3

EVALUATION OF THE NEED FOR INDOOR DUST SAMPLING AT BUILDINGS IN LIBBY WHERE VERMICULITE INSULATION IS PRESENT

1.0 INTRODUCTION

USEPA Region 8 is currently planning a large-scale investigation to identify potentially significant sources of asbestos in and about the community of Libby. One of the sources of concern to EPA is Libby vermiculite insulation (LVI). This material has been shown to be capable of releasing relatively high concentrations of asbestos fibers into air when disturbed (Weis 2001a, 2001b, Grace 1976).

A second medium of potential concern at a building with LVI is indoor dust. This is because any asbestos fibers that have been released from the LVI or other sources may become entrained in indoor dust, and the dust may serve as a secondary source even after the primary source (e.g., the LVI) has been removed or contained.

Because of the cost and time required to perform a microscopic analysis of dust samples at each building where LVI is found to be present, EPA wished to consider whether it was reasonable to assume that dust at such a location might be a potential secondary source, and take steps to remove the dust without the need for sampling. This technical memo presents an assessment of the pros and cons of that approach.

2.0 DATA SUMMARY

A query of the Libby database was performed on 05/03/02. First, a list of all samples of vermiculite insulation was prepared, and a list was prepared of the addresses of the locations where these samples were collected. Next, a list of all dust samples that were collected at any of the same locations (i.e., at buildings with LVI present) was prepared. Finally, the results of transmission electron microscopy (TEM) examination of these dust samples were tabulated and classified into two bins (detect or non-detect). Detects were defined as samples in which one or more Libby-class amphibole fibers were observed that had either a) an aspect ratio $\geq$ 5:1, thickness $\leq$ 0.5 um and length $\geq$ 5 um, or b) an aspect ratio $\geq$ 5:1 and thickness > 0.5 um. These dimensions were used because they include the size range suspected to be of greatest potential human health concern. Samples were assigned to the "Non-detect" bin if they did not contain one or more of the fibers above (even if Libby-class amphibole fibers were observed outside these size bins).

The design of the query and the resulting outputs are provided as Attachment 1. The results are summarized below:

TEM Result	Number of Dust Samples	Percent of Total
Non-detect	230	75%
Detect	75	25%
Total	305	100%

3.0 DISCUSSION

As seen, about 25% of the dust samples collected at locations with LVI had observable levels of Libby class amphibole fibers. Superficially, this would suggest that cleaning up indoor dusts at all locations with LVI might not be necessary in a number of cases, and that testing of dust before cleaning might be appropriate.

However, there are several reasons why the testing of all dusts may not be necessary or effective at this site. First, the detection limits for asbestos fibers in dust samples from the site are generally in the range of 250-300 f/cm^2, with a number of detection limit values in excess of 1,000 f/cm^2 (depending on the number of grids examined and the relative level of debris in the sample). Thus, in many cases, a non-detect result is not strong evidence that no fibers are actually present.

Second, even in the case that the LVI in a building has not released any fibers into indoor dust, fibers might be released to dust as a consequence of the LVI removal activity. While EPA will seek to prevent the release of asbestos fibers from LVI into the remainder of the building during removal activities, the possibility of some fiber contamination cannot be totally excluded. Because of this, EPA will perform a "clearance test" at the end of each LVI removal to establish that it is safe for the occupants of the building to re-enter the space. Because the occupants of the building must be absent from the premises until this test has been completed, there is a premium on the most time-effective approach for determining if re-entry is permissible. If the procedure for establishing clearance required collection and analysis of dust samples before a decision could be made as to whether dust removal was needed, the time before clearance testing would be extended by the length of time needed to collect and analyze the dust sample. This period of time will vary, but not likely to average less than about 3 days. Conversely, if EPA simply performed a dust cleaning immediately upon completion of the LVI removal, and followed this by the clearance test, clearance could be achieved in 1-2 days.

Finally, the incremental cost of performing automatic dust cleanups without prior testing are not expected to be substantial compared to the cost of testing before dust removal. The estimated relative costs are compared in the following table:

Activity	Cost per 100 Buildings	
	Optiuon 1 Test dust before cleanup	Option 2 Cleanup dust without test
Dust collection (a)	$62,500	$0
Dust analysis (b)	$140,000	$0
Dust cleanup (c)	$225,000	$450,000
Total cost	$427,500	$450,000

(a) Assumes 3 composite samples and one blank per location

(b) Assumes 25 grid openings counted per sample

(c) Assume that 50% of post remediation dust samples contain asbestos, indicating the need for dust removal before clearance

4.0 CONCLUSIONS

Based on a consideration of the long turnaround time before clearance if dust testing is required as well as the uncertainty associated with a non-detect in dust, it is concluded that it is reasonable and appropriate to perform an indoor dust removal at all homes in Libby that undergo LVI removal, and that this step is not contingent upon testing the dust for asbestos contamination. Any increment in cost (about 5% of the total cost) for Option 2 are more than justified by the decreased delay in allowing re-entry of building occupants, and will be partially or entirely defrayed by reduced per diem costs.

5.0 REFERENCES

Grace, W.R.. 1976. Controlled Drop Air Sampling, July 23. Memo to HA Brown et al. Dated August 5, 1976. (103Z00768).

Weis, C.P. 2001a. Fibrous Amphibole Contamination in Soil and Dust at Multiple Locations in Libby Poses an Imminent and Substantial Endangerment to Public Health: an Addendum to my Memorandum of May 10, 2000. Memorandum from Christopher P. Weis, USEPA Regional Toxicologist, to Paul Peronard, USEPA On-Scene Coordinator for the Libby

Asbestos Site. Dated 07/11/2001.

Weis, C.P. 2001b. Amphibole Mineral Fibers in Source Materials in Residential and Commercial Areas of Libby Pose an Imminent and Substantial Endangerment to Public Health. Memorandum from Christopher P. Weis, USEPA Regional Toxicologist, to Paul Peronard, USEPA On-Scene Coordinator for the Libby Asbestos Site. Dated 12/18/2001.

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 495637

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 04/01/2002

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ✓ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

ATTACHMENT 1 - Data (10 pages)

Contact the Superfund Records Center to view available document.
(303) 312-6473

Appendix B

Site Health and Safety Plan

Project Name	Libby Asbestos Superfund Site OU4	**Work Assignment No.**	116-RIRI-08BC **Region** 8
Job Site Address	All properties within Libby Valley (Fig. 2-3), encompassing approx. 88 sq. miles including the City of Libby and areas where Libby amphibole asbestos contamination has historically been found. This sampling effort is designed to investigate all properties within the Libby Valley and will include a verbal and visual investigation. CDM project office: 404 Highway 2 West, Libby, Montana 59923	**Client**	U. S. Environmental Protection Agency
		Project	Libby Asbestos RI OU4 - Contaminant Screening Study
Site Contact	Dave Schroeder	**EPA Client Contact**	Jim Christiansen, EPA RPM
Phone No.	406-293-8595 or 406-293-3568	**Phone No.**	303-312-6748

☐ **Amendment No. ____ to Existing Approved HSP - Date Existing Approved HSP ________**

Objectives of Field Work:

The purpose of this sampling effort is to determine the presence or absence of Libby amphibole asbestos contamination. Data obtained for this investigation will include verbal interviews, visual inspections, and onsite soil sampling. Results of this investigation will be used to facilitate any immediate removal actions deemed necessary by the EPA and for future project management decisions.

Type: Check as many as applicable

☐ Active	☐ Landfill	☐ Unknown
■ Inactive	■ Uncontrolled	☐ Military
■ Secure	■ Industrial	■ Other **specify**: Since this CSS will occur on all properties in the Libby Valley, facility types will vary greatly.
■ Unsecure	☐ Recovery	
☐ Enclosed space	☐ Well Field	

Description and Features: Summarize below. Include principal operations and unusual features (containers, buildings, dikes, power lines, hills, slopes, river)

The Town of Libby is located in the extreme northwest corner of Montana. According to historical mining records, 80 percent of the world's vermiculite came from the Zonolite Mountains in Libby, Montana. EPA has determined that the vermiculate ore that was mined from these mountains is contaminated with Libby amphibole asbestos. This ore was shipped throughout the United States both as processed and unprocessed material. EPA has been conducting various investigations to determine potentially contaminated properties, within Libby, which may have resulted from the Libby mining operations. This amphibole asbestos is suspected of affecting the health of the residents at various sites from numerous locations. The properties associated with this investigation may be contaminated with Libby amphibole asbestos from introduced sources. Properties include residential and small commercial areas and vary in size. Potential source materials include attic insulation and contaminated soils.

Surrounding Population: ■ Residential ■ Industrial ■ Rural ■ Urban ☐ Other:

Health and Safety Plan Form	Environmental Protection Agency -- Region 8 --	CDM Federal Programs Corporation
		Project Document No.: 3282-116-PP-HASP

Project Name	Libby Asbestos Superfund Site OU4	**Work Assignment No.**	116-RIRI-08BC **Region** 8
Job Site Address	All properties within Libby Valley (Fig. 2-3), encompassing approx. 88 sq. miles including the City of Libby and areas where Libby amphibole asbestos contamination has historically been found. This sampling effort is designed to investigate all properties within the Libby Valley and will include a verbal and visual investigation. CDM project office: 404 Highway 2 West, Libby, Montana 59923	**Client**	U. S. Environmental Protection Agency
		Project	Libby Asbestos RI OU4 - Contaminant Screening Study
Site Contact	Dave Schroeder	**EPA Client Contact**	Jim Christiansen, EPA RPM
Phone No.	406-293-8595 or 406-293-3568	**Phone No.**	303-312-6748

☐ **Amendment No. ____ to Existing Approved HSP - Date Existing Approved HSP __________**

Objectives of Field Work:

The purpose of this sampling effort is to determine the presence or absence of Libby amphibole asbestos contamination. Data obtained for this investigation will include verbal interviews, visual inspections, and onsite soil sampling. Results of this investigation will be used to facilitate any immediate removal actions deemed necessary by the EPA and for future project management decisions.

Type: Check as many as applicable

☐ Active	☐ Landfill	☐ Unknown
■ Inactive	■ Uncontrolled	☐ Military
■ Secure	■ Industrial	■ Other **specify**: Since this CSS will occur on all properties in the Libby Valley, facility types will vary greatly.
■ Unsecure	☐ Recovery	
☐ Enclosed space	☐ Well Field	

Description and Features: Summarize below. Include principal operations and unusual features (containers, buildings, dikes, power lines, hills, slopes, river)

The Town of Libby is located in the extreme northwest corner of Montana. According to historical mining records, 80 percent of the world's vermiculite came from the Zonolite Mountains in Libby, Montana. EPA has determined that the vermiculate ore that was mined from these mountains is contaminated with Libby amphibole asbestos. This ore was shipped throughout the United States both as processed and unprocessed material. EPA has been conducting various investigations to determine potentially contaminated properties, within Libby, which may have resulted from the Libby mining operations. This amphibole asbestos is suspected of affecting the health of the residents at various sites from numerous locations. The properties associated with this investigation may be contaminated with Libby amphibole asbestos from introduced sources. Properties include residential and small commercial areas and vary in size. Potential source materials include attic insulation and contaminated soils.

Surrounding Population: ■ Residential ■ Industrial ■ Rural ■ Urban ☐ Other:

This Page Reserved for Map (Show Exclusion, Contamination Reduction, and Support Zones. Indicate evacuation and reassembly points.)

See Figures 2-2 and 2-3 in SAP text.

History: *Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.*

The Zonolite Mine began operation in 1924 by owner Edward Alley. In 1925, Great Northern Railroad shipped the first boxcar of "Zonolite" from Libby to an Ohio company that used it to insulate bank vaults, office safes, and filing cabinets. Other firms used the material to make building boards and roofing materials. Processing the material was a straightforward process. The vermiculite ore was stripped from the mine and hauled in trucks to a mill, where it was separated into various commercial sizes through a screening system. Some of the ore was shipped unprocessed. Other material was sent to an expansion plant where it was processed in ovens at about 2,000 degrees, causing it to expand to 15 times its original size. In 1939, Zonolite merged with another company mining at the bottom of the hill that eventually became known as the Zonolite Co. In 1963, the company was sold to W.R. Grace and Co. who expanded the operation and increased production. Through the 60s, 70s, and 80s, millions of tons of vermiculite ore was hauled by rail to Grace plants and other companies in 30 states and 6 foreign countries. At one time, 80 percent of the world's vermiculite came from Libby. The W.R. Grace Company, which owned the mine for 30 years, closed it in 1990 and sold the property 4 years later.

Waste Types: ☐ Liquid ■ Solid ☐ Sludge ☐ Gas ☐ Unknown ☐ Other **Specify**:

Waste Characteristics: Check as many as applicable.

☐ Corrosive	☐ Flammable	☐ Radioactive*
■ Toxic	☐ Volatile	☐ Reactive
☐ Inert Gas	☐ Unknown	■ Other **specify**: Carcinogenic

Work Zones: Describe the Exclusion, Contamination Reduction, and Support Zones in terms onsite personnel will recognize.

Work zones will be used during soil sampling. The exclusion zone will be areas in close proximity to soil sampling areas. The contamination reduction zone will be demarcated by the decontamination station set up at each sampling site. The support zone will be considered the 10-foot perimeter around support vehicles.

Hazards of Concern:

■ Heat Stress attach guidelines	☐ Noise:
■ Cold Stress attach guidelines	☐ Inorganic Chemicals
☐ Explosive/Flammable	☐ Organic Chemicals
☐ Oxygen Deficient	■ Motorized Traffic
☐ Radiological	☐ Heavy Machinery:
■ Biological: stinging insects, venomous reptiles	■ Slips, Trips, and Falls

■ Other **Specify**: Inhalation of particulate matter

Principle Disposal Methods and Practices: Summarize below:

The unused or below-grade material was disposed of by throwing it in piles around the facility. According to the previous site visit, there were no visible stockpiles of product that still exists.

Hazardous Material Summary: Circle waste type and estimate amounts by category

Chemicals Amounts/Units:	***Solids Amounts/Units:***	***Sludges Amounts/Units:***	***Solvents Amounts/Units:***	***Oils Amounts/Units:***	***Other Amounts/Units:***
☐ Acids	☐ Flyash	☐ Paint	☐ Halogenated (chloro, bromo)	☐ Oily Wastes	☐ Laboratory
☐ Pickling Liquors	■ Asbestos	☐ Pigments	☐ Solvents	☐ Gasoline	☐ Pharmaceutical
☐ Caustics	☐ Milling/Mine Tailings	☐ Metal Sludges	☐ Hydrocarbons	☐ Diesel Oil	☐ Hospital
☐ Pesticides	☐ Ferrous Smelter	☐ POTW Sludge	☐ Alcohols	☐ Lubricants	☐ Radiological
☐ Dyes/Inks	☐ Non-ferrous Smelter	☐ Aluminum	☐ Ketones	☐ PCBS	☐ Municipal
☐ Cyanides	☐ Metals:	☐ Distillation Bottoms	☐ Esters	☐ Polynuclear Aromatics	☐ Construction
☐ Phenols			☐ Ethers		☐ Munitions
☐ Halogens	☐ Other	☐ Other	☐ Other	☐ Other	☐ Other
☐ Dioxins	**Specify:**	**Specify:**	**Specify:**	**Specify:**	**Specify:**
☐ Other					
Specify:					

Overall Hazard Evaluation: ☐ High ☐ Medium ■ Low ☐ Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

Justification: CDM personnel will avoid unnecessarily agitating suspect materials and visibly dusty conditions.

Fire/explosion Potential: ☐ High ☐ Medium ■ Low ☐ Unknown

Background Review: ■ Complete ☐ Incomplete Additional information to be collected in this and future investigations.

Known Contaminants	Highest Observed Concentration (specify units and media)	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Excursion Limit (≤ 30 minutes)	Symptoms/Effects of Acute Exposure	Photoionization Potential
Asbestos	2 percent (S)	0.1 f/cc (A)	N/A	NA	Assumed to be similar to overexposure of nuisance dust (e.g., eye irritant)	N/A

ACGIH = American Conference of Government Industrial Hygienists
CA = Human carcinogen
CAS = Chemical Abstract Service
IDLH = Immediately Dangerous to Life and Health (NIOSH standard enforced by law)
LEL = Lower Explosive Limit
mg/m^3 = milligrams per cubic meter
NE = Not established
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
PEL = Permissible Exposure Limit (OSHA-established workplace standards enforced by law)
ppm = parts per million
STEL = Short Term Exposure Limit (15 minute TWA)
TLV = Threshold Limit Values (Recommended by ACGIH)
TWA = Time-Weighted Average (Average concentration for a normal 8-hour working day or 40-hour working week)
$\mu g/kg$ = micrograms per kilogram
$\mu g/$ = micrograms per Liter

* = personal air monitoring
** = ambient/perimeter re-occupancy
*** = cutting hole in ceiling - 30 minute excursion

Health and Safety Plan Form | Environmental Protection Agency -- Region 8 -- | CDM Federal Programs Corporation

Field Activities Covered under this Plan

Task Description/specific Technique-Standard Operating Procedures/Site Location(attach additional sheets as necessary)	*Type*	*Primary*	*Contingency*	*Hazard Schedule*
1 Verbal interview/house sketch	Intrusive	Level D- Modified	Level C - Modified	Hazard Risk: LOW
	Non-Intrusive			Date: 2002
2 Visual Confirmation of potential Zonolite insulation in attic	Intrusive	Level C - Modified	Exit Area	Hazard Risk: LOW
	Non-Intrusive			Date: 2002
3 Soil Sampling	Intrusive	Level D- Modified	Level C - Modified	Hazard Risk: LOW
	Non-Intrusive			Date: 2002
4	Intrusive			Hazard Risk:
	Non-Intrusive			Date:
5	Intrusive			Hazard Risk:
	Non-Intrusive			Date:
6	Intrusive			Hazard Risk:
	Non-Intrusive			Date:
7	Intrusive			Hazard Risk:
	Non-Intrusive			Date:

Personnel and Responsibilities (Include subcontractors)

Name	Firm/Region	CDM Federal Health Clearance	Responsibilities	Onsite Involvement
Jeff Montera	CDM - Denver	Yes	Project Manager	No
Dave Schroeder	CDM - Fairfax	Yes	Onsite Manager	Task 1 -3
Anni Autio	CDM - Cambridge	Yes	Task Manager	No

Protective Equipment: Specify by task. Indicate type and/or material as necessary. Use copies of this sheet if needed.

Block A

Tasks: 1 — ***Level: D - Modified*** — ■ **Primary** ☐ ***Contingency***

Respiratory: ■ Not Needed
☐ SCBA, Airline:
☐ APR: Full or half face
☐ Cartridge: P100
☐ Escape Mask:
☐ Other:

Prot. Clothing: ■ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
☐ Tyvek Coverall: if needed
☐ Cloth Coverall: Cotton as needed
☐ Other: Long pants & long-sleeved shirt

Head and Eye: ☐ Not Needed
■ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat: For drilling and CPT/DPT activities
☐ Other:

Gloves: ■ Not Needed
☐ Undergloves:
☐ Gloves: Nitrile or surgical/latex.
☐ Overgloves:

Boots: ☐ Not Needed
■ Boots: **Leather steel-toed safety boots/shoes**
☐ Overboots:
☐ Rubber:

☐ Other - specify below:

Block B

Tasks: 1 — ***Level: C - Modified*** — ☐ **Primary** ■ ***Contingency***

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
■ APR: Full or half face
■ Cartridge: P100
☐ Escape Mask:
☐ Other:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
■ Tyvek Coverall:
☐ Cloth Coverall: Cotton as needed
☐ Other: Long pants & long-sleeved shirt

Head and Eye: ☐ Not Needed
■ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Gloves: ☐ Not Needed
☐ Undergloves:
■ Gloves: *nitrile or surgical/latex*
☐ Overgloves:

Boots: ☐ Not Needed
■ Boots: **Leather steel-toed safety boots**
■ Overboots:
☐ Rubber:

☐ Other - specify below:

Block C

Tasks: 2 — **Level: C - Modified** — ■ **Primary** ☐ **Contingency**

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
■ APR: Full or half face
■ Cartridge: P100
☐ Escape Mask:
☐ Other:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
■ Tyvek Coverall:
☐ Cloth Coverall:
☐ Other:

Head and Eye: ☐ Not Needed
■ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Gloves: ☐ Not Needed
☐ Undergloves:
■ Gloves: Nitrile or surgical/latex.
☐ Overgloves:

Boots: ☐ Not Needed
■ Boots: **Leather steel-toed safety boots**
■ Overboots:
☐ Rubber:

☐ Other - specify below:

Block D

Tasks: 2 — **Level: Exit Area** — ☐ **Primary** ■ **Contingency**

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
☐ APR:
☐ Cartridge:
☐ Escape Mask:
☐ Other:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
☐ Tyvek Coverall:
☐ Cloth Coverall:
☐ Other:

Head and Eye: ☐ Not Needed
☐ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Gloves: ☐ Not Needed
☐ Undergloves:
☐ Gloves:
☐ Overgloves:

Boots: ☐ Not Needed
☐ Boots: Leather steel-toed work boots
☐ Overboots:
☐ Rubber:

■ Other - specify below:
Exit area and consult H&S manager regarding PPE upgrade

Protective Equipment: Specify by task. Indicate type and/or material as necessary. Use copies of this sheet if needed.

Block A **Tasks: 3** **Level: D - Modified** ■ **Primary** ☐ **Contingency**

Respiratory: ■ Not Needed
☐ SCBA, Airline:
☐APR:
☐Cartridge: P100
☐ Escape Mask:
☐ Other:

Head and Eye: ☐ Not Needed
■ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Boots: ☐ Not Needed
■ Boots: **Leather steel-toed safety boots**
☐ Overboots:
☐ Rubber:

Prot. Clothing: ■ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
☐ Tyvek Coverall: if needed
☐ Cloth Coverall: Cotton as needed
☐ Other: Long pants & long-sleeved shirt

Gloves: ■ Not Needed
☐ Undergloves:
☐ Gloves: Nitrile or surgical/latex.
☐ Overgloves:

☐ Other - specify below:

Block B **Tasks: 3** **Level: C- Modified** ☐ **Primary** ■ **Contingency**

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
■ APR:
■ Cartridge: P100
☐ Escape Mask:
☐ Other:

Head and Eye: ☐ Not Needed
■ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Boots: ☐ Not Needed
■ Boots: **Leather steel-toed safety boots**
■ Overboots:
☐ Rubber:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
■ Tyvek Coverall:
☐ Cloth Coverall: Cotton as needed
☐ Other: Long pants & long-sleeved shirt

Gloves: ☐ Not Needed
☐ Undergloves:
■ Gloves: nitrile or surgical/latex
☐ Overgloves:

■ Other - specify below:

Block C **Tasks:** **Level:** ☐ **Primary** ☐ **Contingency**

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
☐ APR:
☐ Cartridge:
☐ Escape Mask:
☐ Other: PAPA

Head and Eye: ☐ Not Needed
☐ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐Hard Hat:
☐ Other:

Boots: ☐ Not Needed
☐ Boots: **Leather steel-toed safety boots**
☐ Overboots:
☐ Rubber:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
☐ Tyvek Coverall:
☐ Cloth Coverall:
☐ Other:

Gloves: ☐ Not Needed
☐ Undergloves:
☐ Gloves: Leather
☐ Overgloves:

☐ Other - specify below:

Block D **Tasks:** **Level:** ☐ **Primary** ☐ **Contingency**

Respiratory: ☐ Not Needed
☐ SCBA, Airline:
☐ APR:
☐ Cartridge:
☐ Escape Mask:
☐ Other:

Head and Eye: ☐ Not Needed
☐ Safety Glasses:
☐ Face Shield:
☐ Goggles:
☐ Hard Hat:
☐ Other:

Boots: ☐ Not Needed
☐ Boots: Leather steel-toed work boots
☐ Overboots:
☐ Rubber:

Prot. Clothing: ☐ Not Needed
☐ Encapsulated Suit:
☐ Splash Suit:
☐ Apron
☐ Tyvek Coverall:
☐ Cloth Coverall:
☐ Other:

Gloves: ☐ Not Needed
☐ Undergloves:
☐ Gloves: Leather
☐ Overgloves:

☐ Other - specify below:

Monitoring Equipment: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

Instrument	*Task*	*Action Guidelines*		*Comments (Include schedules of use)*
Combustible Gas Indicator	1 - 3	0-10% LEL 10-25% LEL **>25% LEL** 21.0% O_2 <21.0% O_2 **<19.5% O_2**	No explosion hazard Potential explosion hazard; notify SHSC. **Explosion hazard; interrupt task/evacuate** Oxygen normal Oxygen deficient; notify SHSC **Interrupt task/evacuate**	■ Not Needed Entering tanks, vats, sumps, and other confined spaces is strictly forbidden.
Radiation Survey Meter Type ______	1 - 3	3X Background **>2mR/hr**	Notify SHSO and CDM Federal HSM, establish REZ **Interrupt task/evacuate**	■ Not Needed Radiation is not an expected hazard.
Photoionization Detector Type ______ ☐ 11.7 eV ☐ 10.2 eV ☐ 9.8 eV ☐ ___ eV	1 - 3	**Specify:** **Detectable Odor**	 **If odor of any kind is detected, cease work, move to fresh air.**	■ Not Needed If further work is necessary in the area where odors are detected, personnel protection will be evaluated.
Flame Ionization Detector Type ______	1 - 3	**Specify:**		■ Not Needed If further work is necessary in the area where odors are detected, personnel protection will be evaluated.
Detector Tubes/Monitor Type ______ Type ______	1 - 3	**Specify:**		■ Not Needed Toxic gases are not expected to be encountered. Entrance into confined spaces where toxic gases could be concentrated is strictly forbidden.
Respirable Dust Monitor Type ______ Type ______	1 - 3	**Specify:**		■ Not Needed If dusty conditions persist, site will be abandoned and personnel protection reevaluated.
Other **Specify: Visible or nuisance dust and/or unusual vapors (odors)**	1 - 3	Specify: **If team notices unusual odors, heavy dust, or irritation of the eyes or throat, they will exit area and reevaluate personnel protection.**		

Decontamination Procedures

Personalized Decontamination	Sampling Equipment Decontamination	Heavy Equipment Decontamination
Wash well before hand to mouth contact is made. A shower will be taken as soon as possible after leaving the field. Workers will remove protective clothing in this order: (1) wash overboots in soapy water and rinse (2) remove overboots or booties (3) remove gloves (4) remove safety glasses (5) remove Tyvek or cloth coverall, if used (6) remove respirator, if used (7) remove inner gloves (8) wash hands/face before eating/drinking ☐ Not Needed	See CDM Federal SOP 4-5. All sampling equipment will be thoroughly decontaminated as follows: (1) wash and scrub with low phosphate detergent (2) potable tap water rinse (3) potable tap water rinse (4) thoroughly rinse with deionized water (5) air dry (6) wrap in aluminum foil for transport ☐ Not Needed	See CDM Federal SOP 4-5. All heavy equipment and tool parts that contact subsurface soil are constructed of heavy gauge steel and have no natural or synthetic components that could absorb and retain most soil-borne organic contaminants. Prior to removal from the work site, potential contaminated soil/groundwater will be scraped or brushed from the exterior surfaces. The drill rig, augers and any other large equipment in the exclusion zone will be taken to a decon pad and steam cleaned. ■ Not Needed
Containment and Disposal Method	**Containment and Disposal Method**	**Containment and Disposal Method**
All disposable PPE will be double-bagged prior to disposal. Decon water to be disposed onsite. ☐ Not Needed	Decon water to be disposed onsite. ☐ Not Needed	All disposable PPE will be double-bagged prior to disposal. ■ Not Needed

Hazardous Materials Inventory (Investigation-Associated Substances: Attach MSDS)

Preservatives	Decontamination	Calibration Gases and Fluids
☐ Hydrochloric Acid (HCl) ☐ Nitric Acid (HNO_3) ☐ Sulfuric Acid (H_2SO_4) ☐ Sodium Hydroxide (NaOH) ☐ Zinc Acetate (ZnOAc) ☐ Ascorbic Acid ☐ Other: ☐ Other:	☐ Alconox™ ☐ Liquinox™ ☐ Acetone ☐ Methanol ☐ Mineral Spirits ☐ Hexane ☐ Isopropanol ☐ Nitric Acid ■ Other: Water	☐ Isobutylene ☐ Methane ☐ Pentane ☐ Hydrogen ☐ Propane ☐ pH Standard ☐ Conductivity Standard ☐ Other ☐ Other

Health and Safety Plan Form	Environmental Protection Agency Region 8	CDM Federal Programs Corporation

Emergency Contacts	
Water Supply	NA
Site Telephone	1-406-293-8595
EPA Release Report No.	1-800-424-8802
CDM 24-Hour Emergency Chuck Myers	(cell) 1-571-216-7004
Facility Management	NA
Other (Specify) Health & Safety Mgr.	Chuck Myers (home) 1-703-754-0700 SHSO 1-406-293-3567
CHEMTREC Emergency	1-800-424-9300

Emergency Contacts	Name	Phone
Health and Safety Manager	Chuck Myers, CIH	1-703-968-0900 (office)
Project Manager	Jeff Montera	1-303-295-1237
Site Health & Safety Coor.	Douglas J. Updike	1-816-412-3149
Site Health & Safety Officer	Noel Anderson	1-406-293-3567
EPA Contact	Jim Christiansen	1-303-312-6748
Environmental Agency		1-800-234-5677
Health Department		1-406-293-3757
Sheriff's Department	Lincoln County	911
State Spill Line		911
Fire Department	.	911
Police Department - Libby		911
State Police	Highway Patrol	1-800-525-5555
Poison Control Center		1-800-525-5042
Occupational Physician	Health Resources	1-800-350-4511

Contingency Plans Summarize below:

Evacuate site if any unexpected hazardous conditions are encountered. If staff observe hazards for which they have not been prepared, they will withdraw from the area and call CDM Federal Health and Safety. CDM Federal personnel will leave the site and upgrade their level of protection if they experience nausea or dizziness. No volatile compounds are expected to be encountered at concentrations dangerous to human health. If any odors are noted, work will cease and personnel protection reevaluated. In the event of medical emergency, contact Hospital, Police, or Sheriff's Department. If respirable dust is noted, additional engineering controls will be implemented. If these controls do not eliminate the exposure, personnel protection will be re-evaluated.

Medical Emergency	
Hospital Name: St. John's Lutheran Hospital	406-293-7761
Hospital Address: 350 Louisiana Avenue	
Name of Contact at Hospital: NA	
Name of 24-Hour Ambulance:	911

Route to Hospital (See Figure 1)

Directions to the hospital will vary depending on where you are located in the site area. The hospital is located at the intersection of Louisiana and 4th Avenue.

Health and Safety Plan Approvals

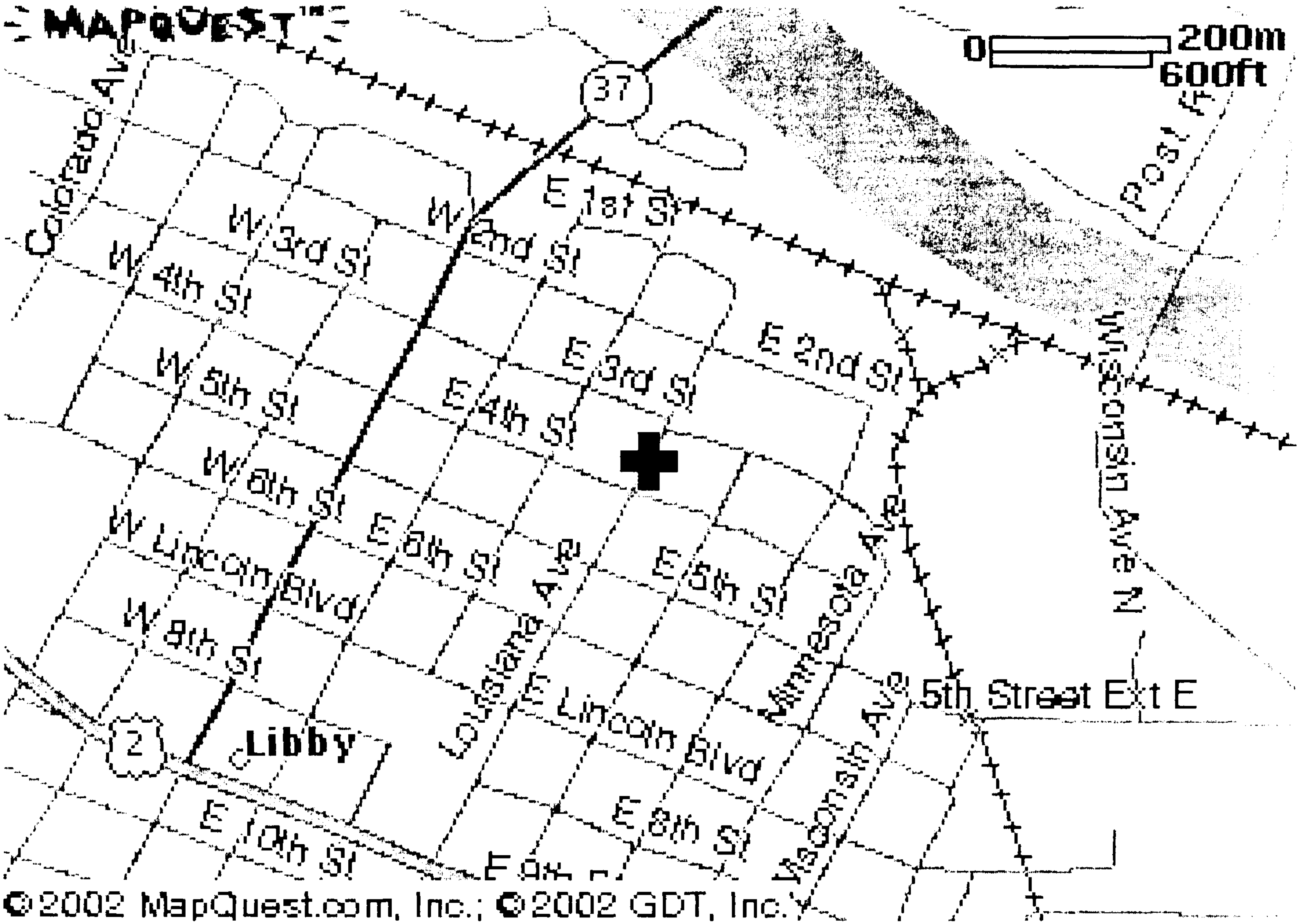
Prepared by: Doug Updike	Date: 4-01-2002
SHSO Signature:	Date:
HSM Signature: Chuck J. Myers	Date: 4-05-02

For: Chuck Myers, CIH

Site: Libby Asbestos RI OU4 - Contaminant Screening Study

Distance to Hospital: Variable

This Page Reserved for Hospital Route Map: Johns Lutheran Hospital, 350 Louisiana Ave, Libby, MT 59923



7GHSLIB OU4

The following personnel have read and fully understand the contents of this Health and Safety Plan and further agree to all requirements contained herein.

Site: Libby, Montana, Asbestos Removal | **Project No.:**

Name and Responsibility	**Affiliation**	**Date**	**Signature**
Jeff Montera	CDM - Denver		
Dave Schroeder	CDM - Fairfax		

Appendix C

CDM Technical Standard Operating Procedures and Site-Specific Guidance Documents

SOP 1-2
Sample Custody

Project-Specific Modification

SOP No.: 1-2

SOP Title: Sample Custody

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Client: U.S. Environmental Protection Agency

Project Manager: Jeff Montera Date: 5/8/02

Technical Reviewer: J. Montera for D. Schneider Date: 5/8/02

QA Reviewer: Date: 5/8/02

EPA Approval: Jac Goldade Date: 5/7/02

Reason for and duration of modification: Sample custody procedures for the Libby asbestos project vary slightly from SOP 1-2. These modifications are necessary for the entire duration of the project.

Sample custody for all soil samples will be in accordance with SOP 1-2, with the following modifications:

Section 3.0, Responsibilities - The field sample custodian is referred to as the sample coordinator for the Libby Asbestos Project.

Section 4.0, Required Supplies - A project-specific chain-of-custody (COC) form will be used for the Libby Asbestos remedial investigation (RI) CSS.

Section 5.1, Chain-of-Custody Record - The project-specific COC form will be completed according to the following guidelines:

Send to: Name of the laboratory that will receive the samples specific to COC. To be completed by the sample coordinator.

Project-Specific Modification

Via: Hand delivery or shipped. Hand delivery refers to samples delivered by hand to the onsite laboratory; shipped refers to samples sent to the laboratory by delivery service (i.e., Federal Express). To be completed by the sample coordinator.

Project: All samples collected in accordance with this sampling and analysis plan (SAP) are part of the CSS. Circle CSS. To be completed by the field team.

Sample Placed in Cooler/Bag: Refers to visual confirmation of the sample in the shipping container. To be completed by the sample coordinator.

Index ID: Unique index identification number used to identify sample, in the form CSS-#####. To be completed by the field team.

Sample Date: The date each sample was collected, in the form MM/DD/YY. To be completed by the field team.

Sample Time: The time each sample was collected, in military time. To be completed by the field team.

Sample Matrix: The matrix of each sample collected, specific to the CSS; S = soil and W = water. To be completed by the field team.

Sample Type: Sample type of each sample collected; G = grab, C = composite. To be completed by the field team.

Volume: Specific to air and dust samples. Does not pertain to the CSS. "NA" should be placed in this field. To be completed by the field team.

Analysis Request: Analysis of each sample collected. All soil samples will be analyzed by IR. IR will be written in the analysis request portion of the COC form by the field team. The sample coordinator and/or laboratory coordinator may request SEM analysis based on Table 5-2 of the SAP. The sample coordinator and/or laboratory coordinator will designate IR for the appropriate samples.

Comments: Any pertinent information regarding the sample (i.e., vermiculite visible) will be entered by either the field team or the sample coordinator.

Sample Received by Lab: To be checked by the sample custodian at the laboratory upon receipt of the samples to confirm presence of each sample on the COC record.

Project-Specific Modification

Total Number of Samples: Total number of samples on the COC form. To be completed by the field team.

Additional Comments: Any additional comments that relate to samples on the COC form (i.e., turn around times). To be completed by the field team or sample coordinator.

Relinquished by: (1) Signed by field team member that relinquishes samples to sample coordinator and company of person relinquishing samples to sample coordinator (i.e., CDM). Date of relinquish shall be in the form MM/DD/YY and time shall be in military time. (2) Additional relinquished by lines to be completed following standard sample custody procedures.

Received by: (1) Signed by sample coordinator that receives samples from the sampling team and company of person accepting samples from the field teams (i.e., CDM). Date and time of acceptance should be the same as date and time of relinquish. (2) Additional received by lines to be completed following standard sample custody procedures.

Sample Condition upon Receipt: Will reflect the condition of samples at the relinquish time (i.e., accept ok or not acceptable with an explanation). To be completed by the person receiving samples.

Page ___ of ___: Sequential page number of the entire COC set sent to the laboratory. To be completed by the sample coordinator.

Chain of Custody Record **Libby Asbestos Investigation** **No. 000000**

U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 300
Denver, CO 80202-2413

Send to: ______________________
____
____
via: ☐ hand delivery ☐ shipped

Project (circle 1): Phase I Phase II Removal Action CSS

Sample Placed in Cooler/Bag	Index ID	Sample Date	Sample Time	Sample Matrix (S=Soil; W=Water; D=Dust; A=Air; B-Bulk Insulation)	Sample Type (G=Grab; C=Composite)	Volume (L) or Area (cm^2)	Analysis Request*	Comments	Sample Received by Lab
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐

***Phase I**: Air: preparation method EPA/540/2-90/005a, analytical method PCM (by NIOSH 7400), TEM (by ISO 10312 and AHERA). Dust: preparation method ASTM D5755-95, analytical method ISO 10312. Solid PLM: preparation and analysis by ISSI-LIBBY-01/NIOSH 9002. Soil IR: preparation and analysis method ISSI-LIBBY-02. Soil TEM: preparation method EPA/540/R-97/028, analytical method ISSI-LIBBY-01/ISO 10312. **Phase II**: Personal Air, Stationary Air: PCM (by NIOSH 7400), TEM (by Modified ISO 10312 – Phase 2 QAPP, approved 2/01), or TEM (AHERA) method. Bulk Insulation and Soil: PLM. Dust Samples: TEM (by ISO 10312). **CSS**: Soil SEM: preparation by ISSI-LIBBY-01, analytical method Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy, Revison 0, July 11, 2000; Soil IR: preparation by ISSI-LIBBY-01, analytical method ISSI-LIBBY-02; Water: preparation by EPA 600/4-84-034, analytical method ISO 10312.

Total Number of Samples _____ END OF SUBMITTAL

Additional Comments:

____

____

Relinquished by (Signature and Company)	**Date/Time**	**Received by (Signature and Company)**	**Date/Time**	**Sample Condition upon Receipt**
Relinquished by (Signature and Company)	**Date/Time**	**Received by (Signature and Company)**	**Date/Time**	**Sample Condition upon Receipt**
Relinquished by (Signature and Company)	**Date/Time**	**Received by (Signature and Company)**	**Date/Time**	**Sample Condition upon Receipt**

SAMPLE CUSTODY

Prepared: David O. Johnson

QA Review: Doug Updike

Issued: Rose Mary Justin 10/12/01
Signature/Date

Technical Review: Jackie Mosher

Approved: 10/12/01
Signature/Date

1.0 OBJECTIVE

Due to the evidentiary nature of samples collected during environmental investigations, possession must be traceable from the time the samples are collected until their derived data are introduced as evidence in legal proceedings. To maintain and document sample possession, sample custody procedures are followed. All paperwork associated with the sample custody procedures will be retained in CDM Federal Programs Corporation (CDM Federal) files unless the client requests that it be transferred to them for use in legal proceedings or at the completion of the contract.

Note: Sample custody documentation requirements vary with the specific EPA region or client. This SOP is intended to present basic sample custody requirements, along with common options. Specific sample custody requirements should be presented in the project-specific quality assurance (QA) project plan or project-specific modification or clarification form (See Section U-1).

2.0 BACKGROUND

2.1 Definitions

Sample – A sample is material to be analyzed that is contained in single or multiple containers representing a unique sample identification number.

Sample Custody – A sample is under custody if:

1. It is in your possession.
2. It is in your view, after being in your possession.
3. It was in your possession and you locked it up.
4. It is in a designated secure area.

Chain-of-Custody Record – A chain-of-custody record is a form used to document the transfer of custody of samples from one individual to another.

Custody Seal - A custody seal is a tape-like seal that is part of the chain-of-custody process and is used to detect tampering with samples after they have been packed for shipping.

Sample Label – A sample label is an adhesive label placed on sample containers to designate a sample identification number and other sampling information.

Sample Tag – A sample tag is attached with string to a sample container to designate a sample identification number and other sampling information. Tags may be used when it is difficult to physically place adhesive labels on the container (e.g., in the case of small air sampling tubes).

3.0 RESPONSIBILITIES

Sampler – The sampler is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

Field Team Leader (FTL) – The FTL is responsible for ensuring that strict chain-of-custody procedures are maintained during all sampling events. The FTL is also responsible for coordinating with the subcontractor laboratory to ensure that adequate information is recorded on custody records. The FTL determines whether proper custody procedures were followed during the fieldwork and decides if additional samples are required.

Field Sample Custodian – The field sample custodian, when designated by the FTL, is responsible for accepting custody of samples from the sampler(s) and properly packing and shipping the samples to the laboratory assigned to do the analyses. A field sample custodian is typically designated only for large and complex field efforts.

4.0 REQUIRED SUPPLIES

- Chain-of-custody records (applicable client or CDM Federal forms)
- Custody seals
- Sample labels or tags
- Clear tape

5.0 PROCEDURES

5.1 Chain-of-Custody Record

This procedure establishes a method for maintaining custody of samples through use of a chain-of-custody record. This procedure will be followed for all samples collected or split samples accepted.

Field Custody

1. Collect only the number of samples needed to represent the media being sampled. To the extent possible, determine the quantity and types of samples and sample locations prior to the actual fieldwork. As few people as possible should handle samples.

2. Complete sample labels or tags for each sample, using waterproof ink.

Transfer of Custody and Shipment

1. Complete a chain-of-custody record for all samples (see Figure 1 for an example of a chain-of-custody record. Similar forms may be used when requested by the client). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the sample custodian in the appropriate laboratory.

   - The date/time will be the same for both signatures when custody is transferred directly to another person. When samples are shipped via common carrier (e.g., Federal Express), the date/time will not be the same for both signatures. Common carriers are not required to sign the chain-of-custody record.

   - In all cases, it must be readily apparent that the person who received custody is the same person who relinquished custody to the next custodian.

   - If samples are left unattended or a person refuses to sign, this must be documented and explained on the chain-of-custody record.

NOTE: If a field sample custodian has been designated, he/she may initiate the chain-of-custody record, sign and date as the relinquisher. The individual sampler(s) must sign in the appropriate block, but does (do) not need to sign and date as a relinquisher (refer to Figure 1).

2. Package samples properly for shipment and dispatch to the appropriate laboratory for analysis. Each shipment must be accompanied with a separate chain-of-custody record.

3. Include a chain-of-custody record identifying its content in all shipments (refer to Figure 1). The original record will accompany the shipment, and the copies will be retained by the FTL and, if applicable, distributed to the appropriate sample coordinators. Freight bills will also be retained by the FTL as part of the permanent documentation.

Figure 1
EXAMPLE CDM Federal Chain-of-Custody Record

CDM Federal Programs Corporation
A subsidiary of Camp Dresser & McKee Inc.

125 Maiden Lane, 5th Floor
New York, NY 10038
(212) 785-9123
Fax: (212) 785-6114

CHAIN OF CUSTODY RECORD

PROJECT ID.	FIELD TEAM LEADER	LABORATORY AND ADDRESS	DATE SHIPPED
PROJECT NAME/LOCATION		LAB CONTRACT:	AIRBILL NO.

MEDIA TYPE
1. Surface Water
2. Groundwater
3. Leachate
4. Field QC
5. Soil/Sediment
6. Oil
7. Waste
8. Other ______

PRESERVATIVES
1. HCl, pH <2
2. HNO3, pH <2
3. NaOH, pH >12
4. H2SO4, pH <2
5. Zinc Acetate, pH >9
6. Ice Only
7. Not Preserved
8. Other ______

SAMPLE TYPE
G = Grab
C = Composite

ANALYSES (List no. of containers submitted)

SAMPLE LOCATION NO.	LABORATORY SAMPLE NUMBER	PRESER-VATIVES ADDED	MEDIA TYPE	SAMPLE TYPE	19__ DATE	TIME SAMPLED								REMARKS (Note if MS/MSD)
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														

SAMPLER SIGNATURES:

RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME	RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME
(SIGN)		(SIGN)		(SIGN)		(SIGN)	
RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME	RELINQUISHED BY: (PRINT)	DATE/TIME	RECEIVED BY: (PRINT)	DATE/TIME
(SIGN)		(SIGN)		(SIGN)		(SIGN)	

COMMENTS:

DISTRIBUTION: White and yellow copies accompany sample shipment to laboratory; yellow copy retained by laboratory. Pink copy retained by samplers. 1/98

NOTE: If requested by the client, different chain-of-custody records may be used. Copies of the template for this record may be obtained from the Fairfax Graphics Department.

Procedure for Completing CDM Federal Example Chain-of-Custody Record (Refer to Figure 1.)

The following procedure is to be used to fill out the CDM Federal chain-of-custody record. The record is provided herein as an example chain-of-custody record. If another type of custody record (i.e., provided by the EPA contract laboratory program or a subcontract laboratory) is used to track the custody of samples, the custody record should be filled out in its entirety.

1. Record project number.
2. Record FTL for the project (if a field sample custodian has been designated, also record this name in the "Remarks" box).
3. Record the name and address of the laboratory to which samples are being shipped.
4. Enter the project name/location or code number.
5. Record overnight courier's airbill number.
6. Record sample location number.
7. Record sample number.
8. Note preservatives type and reference number.
9. Note media type (matrix) and reference number.
10. Note sample type.
11. Enter date of sample collection.
12. Enter time of sample collection in military time.
13. When required by the client, enter the names or initials of the samplers next to the sample location number of the sample they collected.
14. List parameters for analysis and the number of containers submitted for each analysis.
15. Enter MS/MSD (matrix spike/matrix spike duplicate) if sample is for laboratory quality control or other remarks (e.g. sample depth).
16. Sign the chain-of-custody record(s) in the space provided. All samplers must sign each record.
17. If sample tags are used, record the sample tag number in the "Remarks" column.
18. Record date shipped.
19. The originator checks information entered in Items 1 through 16 and then signs the top left "Relinquished by" box, prints his/her name, and enters the current date and time (military).

20. Send the top two copies (usually white and yellow) with the samples to the laboratory; retain the third copy (usually pink) for the project files. Retain additional copies for the project file or distribute as required to the appropriate sample coordinators.

21. The laboratory sample custodian receiving the sample shipment checks the sample label information against the chain-of-custody record. Sample condition is checked and anything unusual is noted under "Remarks" on the chain-of-custody record. The laboratory custodian receiving custody signs in the adjacent "Received by" box and keeps the copy. The white copy is returned to CDM Federal.

5.2 Sample Labels and Tags

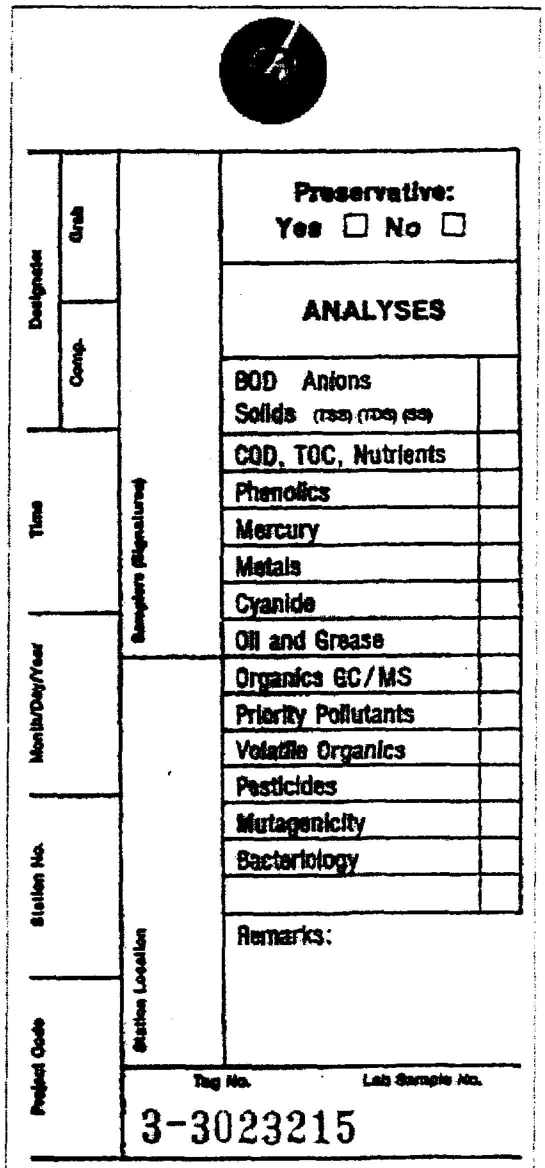
Unless the client directs otherwise, sample labels or tags will be used for all samples collected or accepted for CDM Federal projects.

1. Complete one label or tag with the information required by the client for each sample container collected. A typical label or tag would be completed as follows (see Figure 2 for example of sample tag; labels are completed with the equivalent information):
   - Record the project code (i.e., project or task number).
   - Enter the station number (sample number) if applicable.
   - Record the date to indicate the month, day, and year of sample collection.
   - Enter the time (military) of sample collection.
   - Place a check to indicate composite or grab sample.
   - Record the station (sample) location.
   - Sign in the space provided.
   - Place a check next to "yes" or "no" to indicate if a preservative was added.
   - Place a check under "Analyses" next to the parameters for which the sample is to be analyzed. If the desired analysis is not listed, write it in the empty slot. Note: Do not write in the box for "laboratory sample number."
   - Place or write additional relevant information under "Remarks".

2. Place adhesive labels directly on the sample containers. Place clear tape over the label to protect from moisture.

3. Securely attach sample tags to the sample bottle. On 80 oz. amber bottles, the tag string may be looped through the ring style handle and tied. On all other containers, it is recommended that the string be looped around the neck of the bottle, then twisted and re-looped around the neck until the slack in the string is removed.

Figure 2
EXAMPLE Sample Tag



NOTE: Equivalent sample labels or tags may be used.

5.3 Custody Seals

Custody seals must be placed on the shipping containers (e.g., picnic cooler) prior to shipment. The seal should be signed and dated by a field team member.

Custody seals may also be placed on individual sample bottles. Check with the client or refer to EPA regional guidelines for direction.

5.4 Sample Shipping

The CDM Federal standard operating procedure listed below defines the requirements for packaging and shipping environmental samples.

- CDM Federal SOP 2-1, Packaging and Shipping of Environmental Samples

6.0 RESTRICTIONS/LIMITATIONS

Check with the EPA region or client for specific guidelines. If no specific guidelines are identified, this procedure should be followed.

For EPA Contract Laboratory Program (CLP) sampling events, combined chain-of-custody/traffic report forms or other EPA-specific records may be used. Refer to regional guidelines for completing these forms.

The EPA FORMS II Lite™ software may be used to customize sample labels and custody records when directed by the client or the CDM Federal project manager.

7.0 REFERENCES

U.S. Environmental Protection Agency, *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, EPA/600/R-98/018, February 1998, Section B3.

U.S. Environmental Protection Agency, *National Enforcement Investigations Center, Multi-Media Investigation Manual*, EPA-330/9-89-003-R, Revised March 1992, p.85.

U.S. Environmental Protection Agency, *Contract Laboratory Program (CLP), Guidance for Field Samplers*, EPA-540-R-00-003, Draft Final, June 2001, Section 3.2.

U.S. Environmental Protection Agency, *FORMS II Lite™ User's Guide*, March 2001

U.S. Environmental Protection Agency, Region IV, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, May 1996, Section 3.3.

U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plan*, EM 200-1-3, February 2001, Appendix F.

SOP 2-1

Packaging and Shipping of Environmental Samples

Project-Specific Modification

SOP No.: 2-1

SOP Title: Packaging and Shipping of Environmental Samples

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Client: U.S. Environmental Protection Agency

Project Manager: [signature] Date: 5/8/02

Technical Reviewer: [signature] for D. Schneider Date: 5/8/02

QA Reviewer: [signature] Date: 5/8/02

EPA Approval: [signature] Date: 5/7/02

Reason for and duration of modification: Procedures for shipping environmental samples for the Libby asbestos project vary slightly from CDM Technical SOP 2-1. These modifications are necessary for the entire duration of the project.

Samples collected during this investigation will be packaged and shipped in accordance with CDM Technical SOP 2-1, with the following modifications:

Section 1.4, Required Equipment - Vermiculite (or other absorbent material), bubble wrap, or ice will not be used for packaging or shipping samples.

Section 1.5, Procedures - Lining the cooler with a garbage bag is determined not to be necessary since the samples will already be double-bagged. No vermiculite or other absorbent material will be used to pack the samples. No ice will be used.

PACKAGING AND SHIPPING OF ENVIRONMENTAL SAMPLES

Prepared: Krista Lippoldt

Technical Review: Brian Jenks

QA Review: David O. Johnson

Approved: [signature] 6/20/01
Signature/Date

Issued: Rosemary J. Gustin 6/20/01
Signature/Date

1.0 PACKAGING AND SHIPPING OF ALL SAMPLES – This standard operating procedure (SOP) applies to the packaging and shipping of all environmental samples. If the sample is preserved or radioactive, the following sections may also be applicable.

Section 2.0 – Packaging and Shipping of Samples Preserved with Hexane
Section 3.0 – Packaging and Shipping of Samples Preserved with Sodium Hydroxide
Section 4.0 – Packaging and Shipping of Samples Preserved with Hydrochloric Acid
Section 5.0 – Packaging and Shipping of Samples Preserved with Nitric Acid
Section 6.0 – Packaging and Shipping of Samples Preserved with Sulfuric Acid
Section 7.0 – Packaging and Shipping of Limited Quantity Radioactive Samples

1.1 OBJECTIVE

The objective of this SOP is to outline the requirements for the packaging and shipment of environmental samples.

1.2 BACKGROUND

1.2.1 Definitions

Environmental Sample - An environmental sample is any sample that has less than reportable quantities for any hazardous constituents according to Department of Transportation (DOT) regulations promulgated in 49 CFR - Part 172.

Custody Seal – A custody seal is a narrow adhesive-backed seal that is applied to individual sample containers and/or the sample shipping container (i.e. cooler) before offsite shipment. Custody seals are used as a protective mechanism to ensure that sample integrity is not compromised during transportation from the field to the analytical laboratory.

Secondary Containment – A secondary containment is the container that the sample is shipped in (i.e., plastic overpackaging if liquid sample is collected in glass).

Exempted Quantity – Exempted quantity is the amount of hazardous material that does not fall under DOT/IATA/ICAO regulations. This exemption is very difficult to meet; most shipments will be made under limited quantity.

Limited Quantity – Limited quantity is the maximum amount of a hazardous material for which there is a specific labeling or packaging exception.

Performance Testing – Performance testing is the required testing of outer packaging. These tests include the drop and stacking test.

Qualified Shipper – A qualified shipper is a person who has been adequately trained to perform the functions of shipping hazardous materials.

1.2.2 Discussion

Proper packaging and shipping is necessary to ensure the protection of the integrity of environmental samples shipped for analysis.

1.2.3 Associated Procedure

- CDM Federal SOP 1-2, Sample Custody

1.3 RESPONSIBILITIES

Field Team Leader (FTL) - The field team leader is responsible for ensuring that packaging and sampling procedures are conducted in accordance with this SOP. The field team leader is also responsible for ensuring that CDM Federal properly coordinates laboratory analysis of samples.

1.4 REQUIRED EQUIPMENT

- Coolers with return address of CDM Federal office
- Heavy-duty plastic garbage bags
- Plastic Ziploc®-type bags, small and large
- Clear tape
- Fiber tape – nylon reinforced strapping tape
- Duct tape
- Vermiculite (or equivalent)*
- Bubble wrap (optional)
- Ice
- Custody seals
- Completed chain-of-custody record or CLP custody records, if applicable
- Completed bill of lading
- "This End Up" and directional arrow labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

1.5 PROCEDURES

The following steps must be followed when packing sample bottles and jars for shipment:

1. Verify the samples undergoing shipment meet the definition of "Environmental Sample" and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with the appropriate health and safety coordinator or the health and safety manager should be observed.

2. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape. Line the cooler with a large heavy-duty plastic garbage bag.

3. Be sure the caps on all bottles are tight (will not leak); check to see that labels and chain-of-custody records are completed properly (SOP 1-2, Sample Custody).

4. Place all bottles in separate and appropriately sized plastic zip-top bags and close the bags. Up to three VOA vials may be packed in one bag. Bottles may be wrapped in bubble wrap. Optionally, place three to six VOA vials in a quart metal can and then fill the can with vermiculite or equivalent. Note: Trip blanks must be included in coolers containing VOA samples.

5. Place 2 to 4 inches of vermiculite (or equivalent) into a cooler that has been lined with a garbage bag, and then place the bottles and cans in the bag with sufficient space to allow for the addition of more packing material between the bottles and cans. It is preferable to place glass sample bottles and jars into the cooler vertically. Due to the strength properties of a glass container, there is much less chance for breakage when the container is packed vertically rather than horizontally.

6. Put ice in large plastic zip-top bags (double bagging the zip-tops is preferred) and properly seal. Place the ice bags on top of and/or between the samples. Several bags of ice are required (dependant on outdoor temperature, staging time, etc.) to maintain the cooler temperature at approximately 4° centigrade. Fill all remaining space between the bottles or cans with packing material. Securely fasten the top of the large garbage bag with fiber or duct tape.

7. Place the completed chain-of-custody record or the CLP traffic report form (if applicable) for the laboratory into a plastic zip-top bag, seal the bag, tape the bag to the inner side of the cooler lid and close the cooler.

8. The cooler lid shall be secured with nylon reinforced strapping tape by wrapping each end of the cooler a minimum of two times. Attach a completed chain-of-custody seal across the hinges of the cooler on opposite sides. The custody seals should be affixed to the cooler with half of the seal on the strapping tape so that the cooler cannot be opened without breaking the seal. Complete two more wraps around with fiber tape and place clear tape over the custody seals.

9. The shipping container lid must be marked "THIS END UP" and arrow labels that indicate the proper upward position of the container should be affixed to the cooler. A label containing the name and address of the shipper (CDM Federal) shall be placed on the outside of the container. Labels used in the shipment of hazardous materials (such as Cargo Only Air Craft, Flammable Solids, etc.) are not permitted on the outside of containers used to transport environmental samples and shall not be used. The name and address of the laboratory shall be placed on the container, or when shipping by common courier, the bill of lading shall be completed and attached to the lid of the shipping container.

1.6 RESTRICTIONS/LIMITATIONS

The holding times for the samples packed for shipment must not be exceeded. It is recommended that samples be packed in time to be shipped nightly for overnight delivery. Use caution when shipping samples for weekend delivery; make arrangements with the laboratory before sending samples.

2.0 PACKAGING AND SHIPPING OF SAMPLES PRESERVED WITH HEXANE

2.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

2.2 BACKGROUND

2.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

2.2.2 Transportation

This section was prepared for the shipment of hexane-preserved samples.

2.2.3 Containers

- 40 ml glass VOA vials (up to 1L per outer package)

2.3 RESPONSIBILITY

It is the responsibility of the qualified shipper to ensure that each shipment contains no more than the maximum of 24 VOA vials for a total liquid volume of 1 liter and that the shipment is packaged according to IATA/ICAO packaging instruction Y305 for limited quantities of hexane.

REQUIRED EQUIPMENT

- Outer packaging (for limited quantities) insulated cooler that has passed the performance test
- Garbage bags
- Clear tape
- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (or equivalent)*
- Bubble wrap
- Ice
- Chain-of-custody seals
- Chain-of-custody form
- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 3 flammable liquid labels
- Orientation labels
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

2.5 PACKAGING

The following steps are to be followed when packaging limited quantity samples shipments.

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials

  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody)
- Wrap each container (40 ml VOA vials) in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble wrapped container into a 2.7 mil Ziploc®-type bag, removing trapped air.
- Place wrapped containers inside a polyethylene bottle filled with vermiculite; seal the bottle. (Maximum of 4 VOA vials will fit inside a 500-ml wide-mouth polyethylene bottle.)
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

  HEXANES MIXTURE
  UN1208
  LTD. QTY.

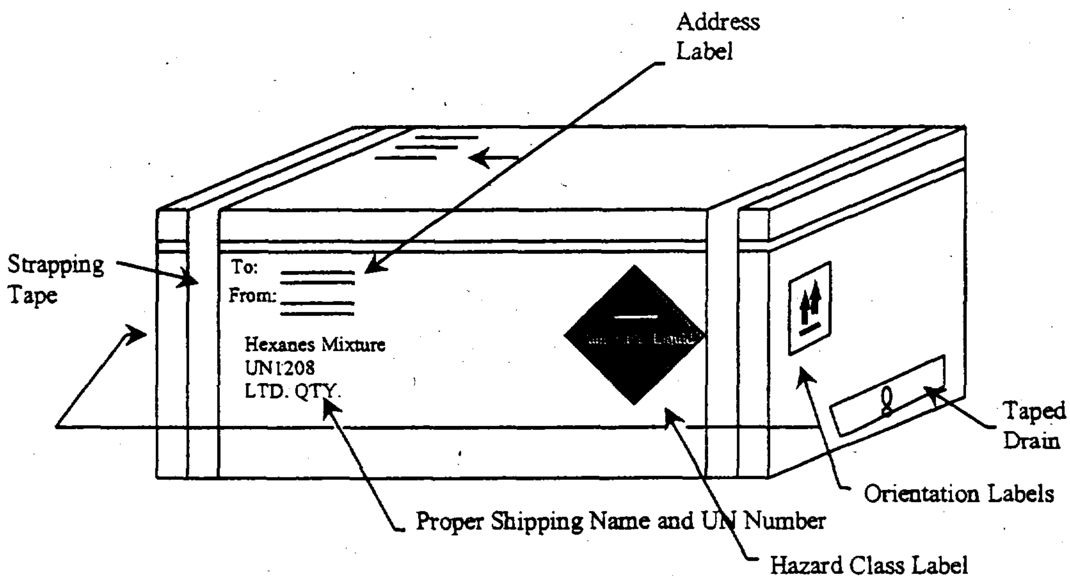
- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Flammable Liquid label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

NOTE: No marking or labeling can be obscured by strapping or duct tape.

NOTE: The inner packaging of dangerous goods may be placed into the designated cooler for shipment. Other non-regulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

Figure 1 Example of Cooler Label/Marking Locations



3.0 PACKAGING AND SHIPPING OF SAMPLES PRESERVED WITH SODIUM HYDROXIDE

3.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

3.2 BACKGROUND

3.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

3.2.2 Transportation

This section was prepared for the shipment of sodium hydroxide (NaOH) preserved samples.

3.2.3 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Exempted Quantities of Preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
NaOH	30%	>12	0.08%		.25	0.5	1	2

5 drops = 1 ml

3.3 RESPONSIBILITY

It is the responsibility of the qualified shipper to determine the amount of preservative in each sample so that accurate determination of quantities can be made.

REQUIRED EQUIPMENT

- Outer packaging (for limited quantities) insulated cooler that has passed the performance test.
- Garbage bags
- Clear tape
- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (or equivalent)*
- Bubble wrap (optional)
- Ice
- Custody seals
- Chain-of-custody form

- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

3.5 PACKAGING

Samples containing NaOH as a preservative that exceed the exempted concentration of 0.08 percent (2 ml of a 30 percent per liter) will be shipped as a limited quantity per packing instruction Y809 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited quantity samples shipments.

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody)
- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble wrapped container into a 2.7 mil Ziploc®-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.

- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

SODIUM HYDROXIDE SOLUTION
UN1824
LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

  NOTE: Samples meeting the exemption concentration of 0.08 percent NaOH by weight will be shipped as non-regulated or non-hazardous.

  NOTE: No marking or labeling can be obscured by strapping or duct tape.

  NOTE: The inner packaging of dangerous goods may be placed into the designated cooler for shipment. Other non-regulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

4.0 PACKAGING AND SHIPPING OF SAMPLES PRESERVED WITH HYDROCHLORIC ACID

4.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

4.2 BACKGROUND

4.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

4.2.2 Transportation

This section was prepared for the shipment of hydrochloric acid (HCl) preserved samples.

4.2.3 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Exempted quantities of preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
HCl	2N	<2	0.04%	.2	.5	1		

5 drops = 1 ml

4.3 RESPONSIBILITY

It is the responsibility of the qualified shipper to determine the amount of preservative in each sample so that accurate determination of quantities can be made.

4.4 REQUIRED EQUIPMENT

- Outer packaging (for limited quantities) insulated cooler that has passed the performance test.
- Garbage bags
- Clear tape

- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (or equivalent)*
- Bubble wrap
- Ice
- Custody seals
- Chain-of-custody form
- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

4.5 PACKAGING

The following steps are to be followed when packaging limited quantity samples shipments.

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody)
- Wrap each container (40 ml VOA vials) in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble wrapped container into a 2.7 mil Ziploc®-type bag, removing trapped air.
- Place wrapped containers inside a polyethylene bottle filled with vermiculite; seal the bottle. (Maximum of 4 VOA vials will fit inside a 500-ml wide-mouth polyethylene bottle.)
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.

- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

HYDROCHLORIC ACID SOLUTION
UN1789
LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

NOTE: Samples meeting the exemption concentration of 0.04 percent HCl by weight will be shipped as non-regulated or non-hazardous.

NOTE: No marking or labeling can be obscured by strapping or duct tape.

NOTE: The inner packaging of dangerous goods may be placed into the designated cooler for shipment. Other non-regulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.

- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

5.0 PACKAGING AND SHIPPING OF SAMPLES PRESERVED WITH NITRIC ACID

5.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

5.2 BACKGROUND

5.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

5.2.2 Transportation

This section was prepared for the shipment of nitric acid (HNO_3) preserved samples.

5.2.3 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Exempted quantities of preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
HNO_3	6N	<2	0.15%		2	4	5	8

5 drops = 1 ml

5.3 RESPONSIBILITY

It is the responsibility of the qualified shipper to determine the amount of preservative in each sample so that accurate determination of quantities can be made.

5.4 REQUIRED EQUIPMENT

- Outer packaging (for limited quantities) insulated cooler that has passed the performance test.
- Garbage bags
- Clear tape
- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (or equivalent)*
- Bubble wrap (optional)
- Ice
- Custody seals
- Chain-of-custody form
- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

5.5 PACKAGING

Samples containing HNO_3 as a preservative that exceed the exempted concentration of 0.15% HNO_3 will be shipped as a limited quantity per packing instruction Y807 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited quantity samples shipments.

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
  - Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody)

- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble wrapped container into a 2.7 mil Ziploc®-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

NITRIC ACID SOLUTION (with less then 20%)
UN2031
LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

NOTE: Samples meeting the exemption concentration of 0.15 percent HNO_3 by weight will be shipped as non-regulated or non-hazardous.

NOTE: No marking or labeling can be obscured by strapping or duct tape.

NOTE: The inner packaging of dangerous goods may be placed into the designated cooler for shipment. Other non-regulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

6.0 PACKAGING AND SHIPPING OF SAMPLES PRESERVED WITH SULFURIC ACID

6.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

6.2 BACKGROUND

6.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

6.2.2 Transportation

This section was prepared for the shipment of sulfuric acid (H_2SO_4) preserved samples.

6.2.3 Containers

The inner packaging container (and amount of preservative) that may be used for these shipments includes:

Exempted quantities of preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
H_2SO_4	37N	<2	0.35%	.1	.25	0.5	1	2

5 drops = 1 ml

6.3 RESPONSIBILITY

It is the responsibility of the qualified shipper to determine the amount of preservative in each sample so that accurate determination of quantities can be made.

6.4 REQUIRED EQUIPMENT

- Outer packaging (for limited quantities) insulated cooler that has passed the performance test.
- Garbage bags
- Clear tape
- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (or equivalent)*
- Bubble wrap
- Ice
- Custody seals
- Chain-of-custody form
- Survey documentation (if shipping from Department of Energy [DOE] or radiological sites)
- Class 8 corrosive labels
- Orientation labels
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

6.5 PACKAGING

Samples containing H_2SO_4 as a preservative that exceed the exempted concentration of 0.35 percent will be shipped as a limited quantity per packing instruction Y809 of the IATA/ICAO Dangerous Goods Regulations.

The following steps are to be followed when packaging limited quantity samples shipments.

- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection

- Sample location
- Sample identification number
- Collector's initials
- Preservative (note amount of preservative used in miscellaneous section of the chain-of-custody)

- Wrap each glass container in bubble wrap (secure with waterproof tape) to prevent breakage.
- Place the bubble wrapped container into a 2.7 mil Ziploc®-type bag, removing trapped air.
- Place glass containers inside a polyethylene bottle filled with vermiculite; seal the bottle.
- Place sufficient amount of vermiculite in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- Place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- The maximum weight of the cooler shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- Wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Mark the outside of the cooler with the proper shipping name of the contents, corresponding UN number, and LTD. QTY. (as shown below).

SULFURIC ACID SOLUTION
UN2796
LTD. QTY.

- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix a Corrosive label to the outside of the cooler.
- Affix package orientation labels on two opposite sides of the cooler.
- Secure the marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of cooler labeling/marking locations is shown in Figure 1.

NOTE: Samples meeting the exemption concentration of 0.35 percent H_2SO_4 by weight will be shipped as non-regulated or non-hazardous.

NOTE: No marking or labeling can be obscured by strapping or duct tape.

NOTE: The inner packaging of dangerous goods may be placed into the designated cooler for shipment. Other non-regulated environmental samples may be added to the cooler for shipment.

- When shipping from a DOE facility, the cooler will be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Complete the Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity (Appendix A).
- Complete a Dangerous Goods Airbill.

7.0 PACKAGING AND SHIPPING OF LIMITED QUANTITY RADIOACTIVE SAMPLES

7.1 OBJECTIVE

This section provides guidance for the shipment of soil and water environmental samples regulated under the DOT Hazardous Materials Regulations and the IATA/ICAO Dangerous Goods Regulations for shipment by air and applies only to domestic shipments.

7.2 BACKGROUND

7.2.1 Definitions

Section 1.2.1 defines the terms relevant to this section.

7.2.2 Transportation

This section was prepared for the shipment of environmental samples containing radioactive materials in limited quantities.

7.2.3 Containers

The inner packaging containers that may be used for these shipments include:

- Any size sample container

7.3 DESCRIPTION/RESPONSIBILITIES

- The qualified shipper will ship all samples that meet the Class 7 definition of radioactive materials and meet the activity requirements specified in Table 7 of 49 CFR 173.425, as Radioactive Materials in Limited Quantity. The qualified shipper will verify that all packages and their contents meet the requirements of 49 CFR 173.421, "Limited Quantities of Radioactive Materials."
- The packaging used for shipping will meet the general requirements for packaging and packages specified in 49 CFR 173.24 and the general design requirements provided in 173.410. These standards state that a package must be capable of withstanding the effects of any acceleration, vibration, or vibration resonance that may arise under normal condition of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole and without loosening or unintentionally releasing the nuts, bolts, or other securing devices even after repeated use.
- If the shipment is from a Department of Energy (DOE) facility, radiological screenings will be completed on all samples taken. The qualified shipper will review the results of each screening (alpha, beta, and gamma speciation). Samples will not be shipped offsite until the radiological screening has been performed.
- The total activity for each package will not exceed the relevant limits listed in Table 7 of 49 CFR 173.425. The A_2 value of the material will be calculated based on all radionuclides found during previous investigations (if any) in the area from which the samples are derived. The A_2 values to be used will be the most restrictive of all potential radionuclides as listed in 49 CFR 173.435.
- The radiation level at any point on the external surface of the package bearing the sample(s) will not exceed 0.005 mSv/hour (0.5 mrem/hour). These will be verified by dose and activity monitoring prior to shipment of the package.
- The removable radioactive surface contamination on the external surface of the package will not exceed the limits specified in 49 CFR 173.443(a). CDM Federal will use the DOE-established free release criteria for removable surface contamination of less than 20 dpm/100 cm^2 (alpha) and 1000 dpm/100 cm^2 (beta/gamma). It should be noted that these values are more conservative than the DOT requirements for removable surface contamination.
- The qualified shipper will verify that the outside of the inner packaging is marked "Radioactive".
- The qualified shipper will verify that the excepted packages prepared for shipment under the provisions of 49 CFR 173.421 have a notice enclosed, or shown on the outside of the package, that reads, "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910".

7.4 REQUIRED EQUIPMENT

- Cooler or other acceptable outer packaging
- Garbage bags
- Clear tape
- Duct tape
- Strapping tape (optional)
- Ziploc®-type bags, small and large
- Vermiculite (for water samples) or equivalent*
- Bubble wrap (optional)
- Ice (if necessary)
- Custody seals
- Chain-of-custody form
- Survey documentation/radiation screening results (if shipping from DOE or radiological sites)
- Orientation labels
- Exempted quantities label
- Consignor/consignee labels

* Check for any client-specific or laboratory requirements related to the use of absorbent packaging materials.

7.5 PACKAGING

The following steps are to be followed when packaging limited quantity samples shipments.

- The cooler is to be surveyed by a qualified radiation control technician to ensure the exterior surfaces do not exceed 0.5 mrem/h on all sides. This survey will be documented and the results reviewed by the qualified shipper.
- Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler.
- All sample containers will be properly labeled and the label protected with waterproof tape prior to sampling.
- At a minimum the label must contain:
  - Project name
  - Project number
  - Date and time of sample collection
  - Sample location
  - Sample identification number
  - Collector's initials
- This step is optional; wrap each container in bubble wrap (secure with waterproof tape) to prevent breakage.

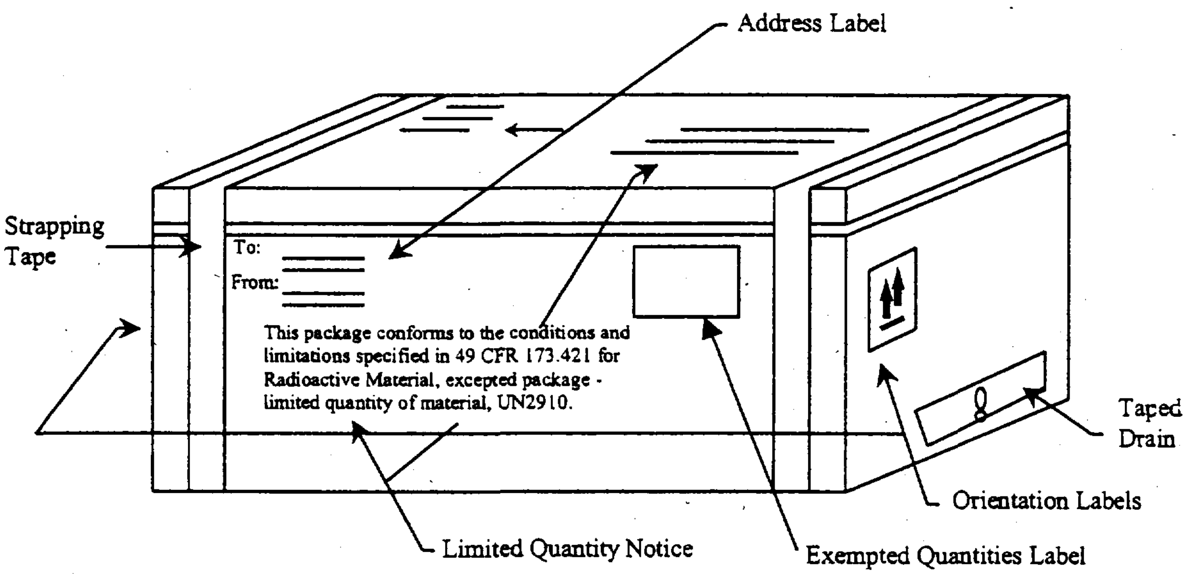
- Place sufficient amount of vermiculite, or approved packaging material, in the bottom of the cooler to absorb any leakage that may occur.
- Place a garbage bag in the cooler.
- Pack the samples appropriately inside the garbage bag (bottles placed upright) to prevent movement during shipment.
- If required, place a sufficient amount of double-bagged ice around the samples to maintain the required temperature during shipment.
- Seal the garbage bag by tying or taping.
- Place a label marked "Radioactive" on the outside of the sealed bag.
- Enclose a notice that includes the name of the consignor or consignee and the following statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910.
- The maximum weight of the package shall not exceed 30 kg (66 lbs) for any limited quantity shipment of dangerous goods.
- Secure the chain-of-custody form (placed inside a Ziploc®-type bag) to the interior of the cooler lid.
- If the shipment is from a DOE or other facility, place the results of the radiation screen and cooler/sample survey with the chain-of-custody.
- If a cooler is used, wrap strapping tape or duct tape around both ends of the cooler and around the cooler lid.
- Affix custody seals to opposite sides of the cooler lid. Cover the custody seals with clear waterproof tape.
- Place a label on the front of the cooler with the company name, contact name, phone number, full street address, and state with zip code for both shipper and recipient.
- Affix package orientation labels on two opposite sides of the cooler/package.
- Affix a completed Excepted Quantities label to the side of the cooler/package.
- Secure any marking and labels to the surface of the cooler with clear waterproof tape to prevent accidental removal during shipment.
- An example of the cooler labeling/marking is shown in Figure 2.

NOTE: No marking or labeling can be obscured by strapping or duct tape.

- Complete the Shipment Quality Assurance Checklist (Appendix B).

NOTE: Except as provided in 49 CFR 173.426, the package will not contain more than 15 grams of ^{235}U.
NOTE: A declaration of dangerous goods is not required.

Figure 2 Radioactive Material - Limited Quantity Cooler Marking Example



8.0 REFERENCES

U.S. Environmental Protection Agency, *Sampler's Guide to the Contract Laboratory Program*, EPA/540/P-90/006, December 1990.

U.S. Environmental Protection Agency, Region IV, *Standard Operating Procedures and Quality Assurance Manual*, February 1991.

APPENDIX A
Dangerous Goods and Hazardous Materials Inspection Checklist for Shipping Limited Quantity

Sample Packaging

Yes	No	N/A	
❑	❑	❑	The VOA vials are wrapped in bubble wrap and placed inside a Ziploc®-type bag.
❑	❑	❑	The VOA vials are placed into a polyethylene bottle, filled with vermiculite, and tightly sealed.
❑	❑	❑	The drain plug is taped inside and outside to ensure control of interior contents.
❑	❑	❑	The samples have been placed inside garbage bags with sufficient bags of ice to preserve samples at 4°C.
❑	❑	❑	The cooler exceeds the 66-pound limit for limited quantity shipment.
❑	❑	❑	The garbage bag has been sealed with tape (or tied) to prevent movement during shipment.
❑	❑	❑	The chain-of-custody has been secured to the interior of the cooler lid.
❑	❑	❑	The cooler lid and sides have been taped to ensure a seal.
❑	❑	❑	The custody seals have been placed on both the front and back hinges of the cooler, using waterproof tape.

Air Waybill Completion

Yes	No	N/A	
❑	❑	❑	Section 1 has the shipper's name, company and address; the account number, date, internal billing reference number; and the telephone number where the shipper can be reached.
❑	❑	❑	Section 2 has the recipient's name and company along with a telephone number where they can be reached.
❑	❑	❑	Section 3 has the **Bill Sender** box checked.
❑	❑	❑	Section 4 has the **Standard Overnight** box checked.
❑	❑	❑	Section 5 has the **Deliver Weekday** box checked.
❑	❑	❑	Section 6 has the number of packages and their weights filled out. Was the total of all packages and their weights figured up and added at the bottom of Section 6?
❑	❑	❑	Under the **Transport Details** box, the **Cargo Aircraft Only** box is obliterated, leaving only the **Passenger and Cargo Aircraft** box.
❑	❑	❑	Under the **Shipment Type**, the **Radioactive** box is obliterated, leaving only the **Non-Radioactive** box.
❑	❑	❑	Under the **Nature and Quantity of Dangerous Goods** box, the **Proper Shipping Name, Class or Division, UN or ID No., Packing Group, Subsidiary Risk, Quantity and Type of Packing, Packing Instructions and Authorization** have been filled out for the type of chemical being sent.
❑	❑	❑	The **Name, Place & Date, Signature, and Emergency Telephone number** appears at the bottom of the FedEx Airbill.
❑	❑	❑	The statement "In accordance with IATA/ICAO" appears in the **Additional Handling Information** box.

Proper Shipping Name	Class or Division	UN or ID No.	Packing Group	Sub Risk	Quantity	Packing Instruction	Authorization
Hydrochloric Acid Solution	8	UN1789	II		1 plastic box × 0.5 L	Y809	LTD QTY
Nitric Acid Solution (with less than 20%)	8	UN2031	II		1 plastic box × 0.5 L	Y807	LTD QTY
Sodium Hydroxide Solution	8	UN1824	II		1 plastic box × 0.5 L	Y809	LTD QTY
Sulfuric Acid Solution	8	UN2796	II		1 plastic box × 0.5 L	Y809	LTD QTY
Hexanes	3	UN1208	II		1 plastic box × 1 L	Y305	LTD QTY

Sample Cooler Labeling

Yes	No	N/A	
☐	☐	☐	The proper shipping name, UN number, and LTD. QTY. appears on the shipping container.
☐	☐	☐	The corresponding hazard labels are affixed on the shipping container; the labels are not obscured by tape.
☐	☐	☐	The name and address of the shipper and receiver appear on the top and side of the shipping container.
☐	☐	☐	The air waybill is attached to the top of the shipping container.
☐	☐	☐	**Up Arrows** have been attached to opposite sides of the shipping container.
☐	☐	☐	Packaging tape does not obscure markings or labeling.

APPENDIX B
SHIPMENT QUALITY ASSURANCE CHECKLIST

Date: ____________ Shipper: ____________________________ Destination: ______________________

Item(s) Description: ____

Radionuclide(s): ____

Radiological Survey Results: surface __________________mrem/hr 1 meter _______________________

Instrument Used: Mfgr: ________________________________ Model: ___________________________

S/N: _______________________________________ Cal Date: __________________________________

LIMITED QUANTITY OR INSTRUMENT AND ARTICLE

Yes No

___ ___ 1. Strong tight package (package that will not leak material during conditions normally incidental to transportation).

___ ___ 2. Radiation levels at any point on the external surface of package less than or equal to 0.5 mrem/hr.

___ ___ 3. Removable surface contamination less than 20 dpm/100 cm^2 (alpha) and 1000 dpm/100 cm^2 (beta/gamma).

___ ___ 4. Outside inner package bears the marking "Radioactive".

___ ___ 5. Package contains less than 15 grams of ^{235}U (check yes if ^{235}U not present).

___ ___ 6. Notice enclosed in or on the package that includes the consignor or consignee and the statement, "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910."

___ ___ 7. Activity less than that specified in 49 CFR 173.425. Permissible package limit: Package Quantity:

___ ___ 8. On all air shipments, the statement, Radioactive Material, excepted package-limited quantity of material shall be noted on the air waybill.

Qualified Shipper: ____________________________ Signature: _______________________________

SOP 2-2
Guide to Handling of Investigation-Derived Waste

Project Specific Modification

SOP No.: 2-2

SOP Title: Guide to Handling Investigation-Derived Waste

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study

Project No.: 3282-116

Client: U.S. Environmental Protection Agency

Project Manager: Jeff Montera Date: 5/8/02

Technical Reviewer: J. Montera for D. Schmoll Date: 5/8/02

QA Reviewer: George A. DeLullo Date: 5/8/02

EPA Approval: Jan Goddard Date: 5/7/02

Reason for and duration of modification: Site-specific procedures for disposing of Libby amphibole asbestos contaminated IDW are different than CDM Technical SOP 2-2. These modifications are necessary for the entire duration of the project.

All IDW will be handled in accordance with CDM Technical SOP 2-2, Guide to Handling Investigation-Derived Waste, with the following modifications:

Section 5.2, Off Site Disposal - All IDW (not including excess soil volume) will be collected in transparent garbage bags and marked "IDW" with an indelible marker. These bags will be deposited into the asbestos contaminated waste stream for deposal at the mine.

GUIDE TO HANDLING INVESTIGATION-DERIVED WASTE

Prepared: Tim Eggert Technical Review: Mike Profit

QA Review: Krista Lippoldt Approved: Signature/Date 6/20/01

Issued: Rosemary J. Austin 6/20/01
Signature/Date

1.0 OBJECTIVE

This standard operating procedure (SOP) presents guidance for the management of investigation-derived waste (IDW). The primary objectives for managing IDW during field activities include:

- Leaving the site in no worse condition than existed prior to field activities
- Remove wastes which pose an immediate threat to human health or the environment
- Proper handling of onsite wastes that do not require off site disposal or extended above-ground containerization
- Complying with federal, state, and facility applicable or relevant and appropriate requirements (ARARs)
- Careful planning and coordination of IDW management options
- Minimizing the quantity of IDW

2.0 BACKGROUND

2.1 Definitions

Hazardous Waste – Discarded material that is regulated listed waste, or waste that exhibits ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.3 or state regulations.

Investigation-Derived Wastes (IDWs) - Discarded materials resulting from field activities such as sampling, surveying, drilling, excavations, and decontamination processes that, in present form, possess no inherent value or additional usefulness without treatment. Wastes may be solid, liquid, or gaseous, or multiphase materials that may be classified as hazardous or non-hazardous.

Mixed-Waste - Any material that has been classified as hazardous and radioactive.

Radioactive Wastes – Discarded materials that are contaminated with radioactive constituents with specific activities in concentrations greater than the latest regulatory criteria (i.e., 10 CFR 20).

Treatment, Storage, and Disposal Facility (TSDF) - Permitted facilities which accept hazardous waste shipments for further treatment, storage, and/or disposal. These facilities must be permitted by the U.S. Environmental Protection Agency (EPA) and appropriate state agencies.

2.2 Discussion

Field investigation activities result in the generation of waste materials that may be characterized as a hazardous or radioactive waste. IDWs may include drilling muds, cuttings, and purge water from test pit and well installation; purge water, soil, and other materials from collection of samples; residues from testing of treatment technologies and pump and treat systems; personal protective equipment (PPE); solutions (aqueous or otherwise) used to decontaminate non-disposable protective clothing and equipment; and other wastes or supplies used in sampling and testing potentially hazardous or radiologically contaminated material.

NOTE: The client's representatives may not be aware of all potential contaminants. The management of IDW must comply with regulatory requirements that are applicable.

3.0 RESPONSIBILITIES

Site Manager - The site manager is responsible for ensuring that all IDW procedures are conducted in accordance with this SOP. The site manager is also responsible for ensuring that handling of IDW is in accordance with site-specific requirements.

Project Manager - The project manager is responsible for identifying site-specific requirements for the disposal of IDW in accordance with federal, state, and/or facility requirements.

Field Crew Members - Field crew members are responsible for implementing this SOP and communicating any unusual or unplanned condition to the project manager's attention.

4.0 REQUIRED EQUIPMENT

Equipment required for IDW containment will vary according to site-specific/client requirements. Management decisions concerning the necessary equipment required should consider: containment method, sampling, labeling, maneuvering, and storage (if applicable). Equipment must be on site and inspected before commencing work.

4.1 IDW Containment Devices

The appropriate containment device (drums, tanks, etc.) will depend on site- or client-specific requirements and the ultimate disposition of the IDW. Typical IDW containment devices can include:

- Plastic sheeting (polyethylene) with a minimum thickness of 20 millimeters
- Department of Transportation (DOT) approved steel containers
- Bulk storage tanks comprised of polyethylene or steel

Containment of IDW should be segregated by waste type (i.e., solid or liquid, corrosive or flammable, etc.) and source location. Volume of the appropriate containment device should be site-specific.

4.2 IDW Container Labeling

A "Waste Container" or "IDW Container" label or indelible marking should be applied to each container. Labeling or marking requirements for onsite IDW not expected to be transported off site are:

- Labels and markings that contain the following information: project name; generation date; location of waste origin; container identification number; sample number (if applicable); contents (drill cuttings, purge water, PPE, etc.).
- Each label or marking will be applied to the upper one-third of the container at least twice, on opposite sides.
- Containers that are five-gallons or less may only require one label or set of markings.
- Labels or markings will be positioned on a smooth part of the container. The label must not be affixed across container bungs, seams, ridges, or dents.
- Labels must be constructed of a weather-resistive material with markings made with a permanent marker or paint pen and capable of enduring the expected weather conditions. If markings are used, the color must be easily distinguishable from the drum color.
- Labels will be secured in a manner to ensure the label remains affixed to the container.

Labeling or marking requirements for IDW expected to be transported off site must be in accordance with the requirements of 49 CFR 172.

4.3 IDW Container Movement

Staging areas for IDW containers should be predetermined and in accordance with site-specific and/or client requirements. Arrangements should be made prior to field mobilization as to the methods and personnel required to safely transport IDW containers to the staging area. Transportation off site onto a public roadway is prohibited unless 49 CFR 172 requirements are met.

4.4 IDW Container Storage

Containerized IDW should be staged pending chemical analysis or further onsite treatment. Staging areas and bulk storage procedures are to be determined according to site-specific requirements. Containers are to be stored in such a fashion that the labels can be easily read. A secondary/spill container must be provided as appropriate.

5.0 PROCEDURES

The three general options for managing IDW are (1) collection and onsite disposal; (2) collection for off site disposal; and (3) collection and interim management. Attachment 1 summarizes media-specific information on generation processes and management options. The option selected should take into account the following factors:

- Type (soil, sludge, liquid, debris), quantity, and source of IDW
- Risk posed by managing the IDW on site
- Compliance with regulatory requirements
- IDW minimization and consistency with the IDW remedy and the site remedy

In all cases the client should approve the plans for IDW. Formal plans for the management of IDW must be prepared as part of a work plan or separate document.

5.1 Onsite Disposal

5.1.1 Soil/Sludge/Sediment

The options for handling soil/sludge/sediment IDW are as follows:

1. Return to boring, pit, or source immediately after generation as long as returning the media to these areas will not increase site risks (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate "clean" areas).

2. Spread around boring, pit, or source within the area of contamination (AOC) as long as returning the media to these areas will not increase site risks (e.g., direct contact with surficial contamination).

3. Consolidate in a pit within the AOC as long as returning the media to these areas will not increase site risks (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate "clean" areas).

4. Send to onsite TSDF - may require analytical analysis prior to treatment/disposal.

NOTE: These options may require client and/or regulatory approval.

5.1.2 Aqueous Liquids

The options for handling aqueous liquid IDW are as follows:

1. Discharge to surface water, only when IDW is not contaminated.

2. Discharge to ground surface close to the well, only if soil contaminants will not be mobilized in the process and the action will not contaminate clean areas. If IDW from the sampling of background up-gradient wells is not a community concern nor associated with soil contamination, this presumably uncontaminated IDW may be released on the ground around the well.

3. Discharge to sanitary sewer.

4. Send to onsite TSDF - may require analysis prior to treatment/disposal.

NOTE: These options may require analytical results to obtain client and/or regulatory approval.

5.1.3 Disposable PPE

The options for handling disposable PPE are as follows:

1. Double-bag contents in non-transparent trash bags and place in onsite industrial dumpster, only if PPE is not contaminated.

2. Containerize, label, and send to onsite TSDF - may require analysis prior to treatment/ disposal.

5.2 Off Site Disposal

Before sending to an offsite TSDF, analysis may be required. Also, manifests are required. Arrangements must be made with the client responsible for the site; it is CDM Federal's policy not to sign manifests. The TSDF and transporter must be permitted for the respective wastes.

5.2.1 Soil/Sludge/Sediment

When the final site remedy requires off site treatment and disposal, the IDW may be stored (e.g., drummed, covered in a waste pile) or returned to its source until final disposal. The management option selected should take into account the potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.2.2 Aqueous Liquids

When the final site remedy requires off site treatment and disposal, the IDW may be stored (e.g., mobile tanks or drums) until final disposal. The management option selected should take into account the potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.2.3 Disposable PPE

When the final site remedy requires off site treatment disposal, the IDW may be containerized and stored. The management option selected should take into account potential for increased risks, applicable regulations, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

5.3 Interim Measures

All interim measures must be approved by the client and regulatory agencies.

1. Storing IDW on site until the final action may be practical in the following situations:

    A. Returning wastes (especially sludges and soils) to their onsite source area would require re-excavation for disposal in the final remediation alternative.

    B. Interim storage in containers may be necessary to provide adequate protection to human health and the environment.

    C. Off site disposal options may trigger land disposal regulations under the Resource Conservation and Recovery Act (RCRA). Storing IDW until the final disposal of all wastes from the site will eliminate the need to address this issue more than once.

    D. Interim storage may be necessary to provide time for sampling and analysis.

2. Segregate and containerize all waste for future treatment and/or disposal.

    A. Containment options for soil/sludge/sediment may include drums or covered waste piles in AOC.

    B. Containment options for aqueous liquids may include mobile tanks or drums.

    C. Containment options for PPE may include drums or roll-off boxes.

6.0 RESTRICTIONS/LIMITATIONS

SITE MANAGERS SHOULD DETERMINE THE MOST APPROPRIATE DISPOSAL OPTION FOR AQUEOUS LIQUIDS ON A SITE-SPECIFIC BASIS. Parameters to consider, especially when determining the level of protection, include the volume of IDW, the contaminants present in the groundwater, the presence of contaminants in the soil at the site, whether the groundwater or surface water is a drinking water supply, and whether the groundwater plume is contained or moving. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components.

Disposable sampling materials, disposable PPE, decontamination fluids, etc. will always be managed on a site-specific basis. **UNDER NO CIRCUMSTANCES SHOULD THESE TYPES OF MATERIALS BE BROUGHT BACK TO THE OFFICE OR WAREHOUSE.**

7.0 REFERENCES

Environmental Resource Center, *Hazardous Waste Management Compliance Handbook*, Van Nostrand Reinhold, 1992.

Institute of Hazardous Materials Management, *Handbook on Hazardous Materials Management*, 4th Ed., 1992.

U. S. Environmental Protection Agency, Region IV, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, May 1996 and 1997 revisions.

U. S. Environmental Protection Agency, *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.1, 1987.

U. S. Environmental Protection Agency, *Management of Investigation-Derived Wastes During Site Inspections*, EPA/540/G-91/009, May 1991.

U. S. Environmental Protection Agency, *Low-Level Mixed Waste: A RCRA Perspective for NRC Licensees*, EPA/530-SW-90-057, August 1990.

U. S. Environmental Protection Agency, *Guide to Management of Investigation-Derived Wastes*, 9345.3-03FS, January 1992.

ATTACHMENT 1
IDW MANAGEMENT OPTIONS

TYPE OF IDW	GENERATION PROCESSES	MANAGEMENT OPTIONS
Soil	• Well/Test pit installations • Borehole drilling • Soil sampling	**Onsite Disposal** • Return to boring, pit, or source immediately after generation • Spread around boring, pit, or source within the AOC • Consolidate in a pit (within the AOC) • Send to onsite TSDF **Off site Disposal** • Client to send to off site TSDF **Interim Management** • Store for future treatment and/or disposal
Sludge/Sediment	• Sludge pit/sediment sampling	**Onsite Disposal** • Return to boring, pit, or source immediately after generation • Send to onsite TSDF **Off site Disposal** • Client to send to off site TSDF **Interim Management** • Store for future treatment and/or disposal
Aqueous liquids (groundwater, surface water, drilling fluids, wastewaters)	• Well installation/development • Well purging during sampling • Groundwater discharge during pump tests • Surface water sampling • Waste water sampling	**Onsite Disposal** • Pour onto ground close to well (non-hazardous waste) • Discharge to sewer • Send to onsite TSDF **Off site Disposal** • Client to send to off site commercial treatment unit • Client to send to publicly owned treatment works (POTW) **Interim Management** • Store for future treatment and/or disposal
Decontamination fluids	• Decontamination of PPE and equipment	**Onsite Disposal** • Send to onsite TSDF • Evaporate (for small amounts of low contamination organic fluids) • Discharge to ground surface **Off site Disposal** • Client to send to off site TSDF • Discharge to sewer **Interim Management** • Store for future treatment and/or disposal

ATTACHMENT 1
IDW MANAGEMENT OPTIONS

TYPE OF IDW	GENERATION PROCESSES	MANAGEMENT OPTIONS
Disposable PPE and Sampling Equipment	• Sampling procedures or other onsite activities	**Onsite Disposal** • Place in onsite industrial dumpster • Send to onsite TSDF **Off site Disposal** • Client to send to off site TSDF **Interim Management** • Store for future treatment and/or disposal

Adapted from U.S. Environmental Protection Agency, Guide to Management of Investigation-Derived Wastes, 9345-03FS, January 1992.

SOP 4-1

Field Logbook Content and Control

FIELD LOGBOOK CONTENT AND CONTROL

Prepared: Del Baird

Technical Review: Larry Davidson

QA Review: David O. Johnson

Approved:

Issued: Rosemary J. Gustin 6/20/01
Signature/Date

Signature/Date

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to set CDM Federal criteria for content entry and form of field logbooks. Field logbooks are an essential tool to document field activities for historical and legal purposes.

2.0 BACKGROUND

2.1 Definitions

Biota - The flora and fauna of a region.

Magnetic Declination Corrections - Compass adjustments to correct for the angle between magnetic north and geographical meridians.

2.2 Discussion

Information recorded in field logbooks includes field team names, observations, data, calculations, date/time, weather, and description of the data collection activity, methods, instruments, and results. Additionally, the logbook may contain deviations from plans and descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

3.0 RESPONSIBILITIES

Field Team Leader (FTL) - The FTL is responsible for ensuring that the format and content of data entries are in accordance with this procedure.

Site Personnel - All CDM Federal employees who make entries in field logbooks during onsite activities are required to read this procedure prior to engaging in this activity. The FTL will assign field logbooks to site personnel who will be responsible for their care and maintenance. Site personnel will return field logbooks to the records file at the end of the assignment.

4.0 REQUIRED EQUIPMENT

- Site-specific plans
- Field notebook
- Indelible black or blue ink pen
- Ruler or similar scale

5.0 PROCEDURES

5.1 Preparation

In addition to this SOP, site personnel responsible for maintaining logbooks must be familiar with all procedures applicable to the field activity being performed. These procedures should be consulted as necessary to obtain specific information about equipment and supplies, health and safety, sample collection, packaging, decontamination, and documentation. These procedures should be located at the field office.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the logbook. Prior to use in the field, each logbook will be marked with a specific document control number issued by the document control administrator, if required by the contract quality implementation plan (QIP). Not all contracts require document control numbers. The following information shall be recorded on the cover of the logbook:

- Field logbook document control number.
- Activity (if the logbook is to be activity-specific) and location.
- Name of CDM Federal contact and phone number(s).
- Start date.
- In specific cases, special logbooks may be required (e.g., waterproof paper for storm water monitoring).

The first few (approximately five) pages of the logbook will be reserved for a table of contents (TOC). Mark the first page with the heading and enter the following:

<u>TABLE OF CONTENTS</u>

Date/Description	Page
(Start Date)/Reserved for TOC	1-5

The remaining pages of the table of contents will be designated as such with "TOC" written on the top center of each page.

5.2 Operation

The following is a list of requirements that must be followed when using a logbook:

- Record work, observations, quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are specified by an activity-specific plan, this information need not be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not erase or blot out any entry at any time. Indicate any deletion by a single line through the material to be deleted. Initial and date each deletion. Take care to not obliterate what was written previously.
- Do not remove any pages from the book.

Specific requirements for field logbook entries include:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial and date all changes.
- Multiple authors must sign out the logbook by inserting the following:

  Above notes authored by:
  - (Sign name)
  - (Print name)
  - (Date)

- A new author must sign and print his/her name before additional entries are made.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:
  - Date and time
  - Name of individual making entry
  - Names of field team and other persons on site
  - Description of activity being conducted including station or location (i.e., well, boring, sampling location number) if appropriate
  - Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction, and speed) and other pertinent data
  - Level of personal protection to be used
  - Serial numbers of instruments
  - Required calibration information
  - Serial/tracking numbers on documentation (e.g., carrier air bills)

Entries into the field logbook shall be preceded with the time (written in military units) of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In these cases, the logbook must reference the automatic data record or form.

At each station where a sample is collected or an observation or measurement made, a detailed description of the location of the station is required. Use a compass (include a reference to magnetic declination corrections), scale, or nearby survey markers, as appropriate. A sketch of station location may be warranted. All maps or sketches made in the logbook should have descriptions of the features shown and a direction indicator. It is preferred that maps and sketches be oriented so that north is toward the top of the page. Maps, sketches, figures, or data that will not fit on a logbook page should be referenced and attached to the logbook to prevent separation.

Other events and observations that should be recorded include:

- Changes in weather that impact field activities.
- Deviations from procedures outlined in any governing documents. Also record the reason for any noted deviation.
- Problems, downtime, or delays.
- Upgrade or downgrade of personal protection equipment.

5.3 Post-Operation

To guard against loss of data due to damage or disappearance of logbooks, completed pages shall be periodically photocopied (weekly, at a minimum) and forwarded to the field or project office. Other field records shall be photocopied and submitted regularly and as promptly as possible to the office. When possible, electronic media such as disks and tapes should be copied and forwarded to the project office.

At the conclusion of each activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated, and that corrections were made properly (single lines drawn through incorrect information, then initialed and dated). The completed logbook shall be submitted to the records file.

6.0 RESTRICTIONS/LIMITATIONS

Field logbooks constitute the official record of onsite technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by CDM Federal personnel and their subcontractors. They are documents that may be used in court to indicate dates, personnel, procedures, and techniques employed during site activities. Entries made in these notebooks should be factual, clear, precise, and non-subjective. Field logbooks, and entries within, are not to be utilized for personal use.

7.0 REFERENCES

Sandia National Laboratories, *Procedure for Preparing, Sampling and Analysis Plan, Site-Specific Sampling Plan, and Field Operating Procedures*, QA-02-03, Albuquerque Environmental Program Department 3220, Albuquerque, New Mexico, 1991.

Sandia National Laboratories, Division 7723, *Field Operation Procedure for Field Logbook Content and Control, Environmental Restoration Department*, Albuquerque, New Mexico, 1992.

SOP 4-2
Photographic Documentation of Field Activities

Project-Specific Modification

SOP No.: 4-2

SOP Title: Photographic Documentation of Field Activities

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Client: U.S. Environmental Protection Agency

Project Manager: G. Morton Date: 5/8/02

Technical Reviewer: G. Morton for D. Schlosser Date: 5/8/02

QA Reviewer: Date: 5/8/02

EPA Approval: Date: 5/7/02

Reason for and duration of modification: Site-specific procedures for photographs taken by digital cameras are different than the current SOP.

All photographs will be recorded in accordance with CDM Technical SOP 4-2, Photographic Documentation of Field Activities, with the following modifications:

Section 5.2.2, General Guidelines for Still Photography - A slate is not required for each new roll of film. The information for the slate will be recorded in the field logbook. The numbers assigned by the digital camera will be used instead of the photographer assigning the number. The caption information will either be on the back of the photograph or the photograph will be numbered or labeled and the caption information listed next to the number or label in the photograph log. On the digital photos, a caption will be included in the picture stating property address/location, date, and name of feature. All team members, as stated in the logbook, will be photographers and witnesses at the property. Slates are not required for close-up photographs. Instead the required information can be listed in the logbook or photograph log. A color strip is not required for close-up or feature photographs.

Section 5.2.4, Photographic Documentation - The name of the laboratory, time and date of drop-off, and receipt of film is not required to be recorded for this project.

Project-Specific Modification

Section 5.3.2. Archive Procedures - Digital photographs will be archived on compact discs. These discs will be assigned a document control dumber written on the disc case as well as well as the disc.

PHOTOGRAPHIC DOCUMENTATION OF FIELD ACTIVITIES

Prepared: David O. Johnson

Technical Review: Jackie Mosher

QA Review: Doug Updike

Approved: 10/12/01
Signature/Date

Issued: Rose Mary Gustin 10/12/01
Signature/Date

1.0 OBJECTIVE

The purpose of this standard operating procedure (SOP) is to provide standard guidelines and methods for photographic documentation, which include still and digital photography and videotape recordings of field activities and site features (geologic formations, core sections, lithologic samples, water samples, general site layout, etc.). This document shall provide guidelines designed for use by a professional or amateur photographer. This SOP is intended for circumstances when formal photographic documentation is required. Based on project requirements, it may not be applicable for all photographic activities.

2.0 BACKGROUND

2.1 Definitions

Photographer – A photographer is the camera operator (professional or amateur) of still photography, including digital photography, or videotape recording whose primary function with regard to this SOP is to produce documentary or data-oriented visual media.

Identifier Component – Identifier components are visual components used within a photograph such as visual slates, reference markers, and pointers.

Standard Reference Marker – A standard reference marker is a reference marker that is used to indicate a feature size in the photograph and is a standard length of measure, such as a ruler, meter stick, etc. In limited instances, if a ruled marker is not available or its use is not feasible, it can be a common object of known size placed within the visual field and used for scale.

Slates – Slates are blank white index cards or paper used to present information pertaining to the subject/ procedure being photographed. Letters and numbers on the slate will be bold and written with black, indelible marking pens.

Arrows and Pointers – Arrows and pointers are markers/pointers used to indicate and/or draw attention to a special feature within the photograph.

Contrasting Backgrounds – Contrasting backgrounds are backdrops used to lay soil samples, cores, or other objects on for clearer viewing and to delineate features.

Data Recording Camera Back – A data recording camera back is a camera attachment or built-in feature that will record, at the very least, frame numbers and dates directly on the film.

2.2 Discussion

Photographs and videotape recordings made during field investigations are used as an aid in documenting and describing site features, sample collection activities, equipment used, and possible lithologic interpretation. This SOP is designed to illustrate the format and desired placement of identifier components, such as visual slates, standard reference markers, and pointers. These items shall become an integral part of the "visual media" that, for the purpose of this document, shall encompass still photographs, digital photographs, and videotape recordings (or video footage). The use of a photographic logbook and standardized entry procedures are also outlined. These procedures and guidelines will minimize potential ambiguities that may arise when viewing the visual media and ensure the representative nature of the photographic documentation.

2.3 Associated Procedures

- CDM Federal SOP 4-1, Field Logbook Content and Control

3.0 RESPONSIBILITIES

Field Team Leader (FTL) – The FTL is responsible for ensuring that the format and content of photographic documentation are in accordance with this procedure. The FTL is responsible for directing the photographer to specific situations, site features, or operations that the photographer will be responsible for documenting.

Photographer – The photographer shall seek direction from the FTL and regularly discuss the visual documentation requirements and schedule. The photographer is responsible for maintaining a logbook per Sections 5.1, 5.2.4, and 5.3.1 of this SOP.

4.0 REQUIRED EQUIPMENT

The following is a general list of equipment that may be used:

- 35mm camera or disposable single use camera (35mm or panoramic use)
- Digital camera
- Video camera
- Logbook
- Indelible black or blue ink pen
- Standard reference markers
- Slates
- Arrows or pointers

- Contrasting backgrounds
- Medium speed, or multi purpose fine-grain, color, 35 mm, negative film or slide film (project dependent)
- Data recording camera back (if available)
- Storage medium for digital camera

5.0 PROCEDURES

5.1 Documentation

A commercially available, bound logbook will be used to log and document photographic activities. Review the CDM Federal SOP 4-1 (Field Logbook Content and Control) and prepare all supplies needed for logbook entries.

Note: A separate photographic logbook is not required. A portion of the field logbook may be designated as the photographic log and documentation section.

5.1.1 Field - Health and Safety Considerations

There are no hazards that an individual will be exposed to specific to photographic documentation. However, site-specific hazards may arise depending on location or operation. Personal protective equipment used in this operation will be site-specific and dictated through requirements set by the site safety officer, site health and safety plan, and/or prescribed by the CDM Federal Corporate Health and Safety Program. The photographer should contact the site safety officer for health and safety orientation prior to commencing field activities. The site health and safety plan must be read prior to entry to the site, and all individuals must sign the appropriate acknowledgement that this has been done.

The photographer should be aware of any potential physical hazards while photographing the subject (e.g., low overhead hazard, edge of excavation).

5.2 OPERATION

5.2.1 General Photographic Activities in the Field

The following sections provide general guidelines that should be followed to visually document field activities and site features using still/digital cameras and video equipment. Listed below are general suggestions that the photographer should consider when performing activities under this SOP:

- The photographer should be prepared to make a variety of shots, from closeup to wide-angle. Many shots will be repetitive in nature or format especially closeup site feature photographs. Consideration should therefore be given to designing a system or technique that will provide a reliable repetition of performance.

- All still film photographs should be made using a medium speed, or multi purpose fine-grain, color negative film in the 35 mm format unless otherwise directed by the FTL.
- It is suggested that Kodak brand "Ektapress Gold Deluxe" film or equivalent be used as the standard film for the still photography requirements of the field activities. This film is stable at room temperature after exposure and will better survive the time lag between exposure and processing. It is suggested that film speed ASA 100 should be used for outdoor photographs in bright sunlight, ASA 200 film should be used in cloudy conditions, and ASA 400 film should be used indoors or for very low-light outdoor photographs.
- No preference of videotape brand or digital storage medium is specified and is left to the discretion of the photographer.
- The lighting for sample and feature photography should be oriented toward a flat condition with little or no shadow. If the ambient lighting conditions are inadequate, the photographer should be prepared to augment the light (perhaps with reflectors or electronic flash) to maintain the desired visual effect.
- Digital cameras have multiple photographic quality settings. A camera that obtains a higher resolution (quality) has a higher number of pixels and will store a fewer number of photographs per digital storage medium.

5.2.2 General Guidelines for Still Photography

Slate Information

When directed by the FTL, each new roll of film or digital storage medium shall contain upon the first usable frame (for film) a slate with consecutively assigned control numbers (a consecutive, unique number that is assigned by the photographer as in sample numbers).

Caption Information

All still photographs will have a full caption permanently attached to the back or permanently attached to a photo log sheet. The caption should contain the following information (digital photographs should have a caption added after the photographs are downloaded):

- Film roll control number (if required) and photograph sequence number
- Date and time
- Description of activity/item shown
- Direction (if applicable)
- Photographer

When directed by the FTL, a standard reference marker should be used in all documentary visual media. While the standard reference marker will predominantly be used in closeup feature documentation, inclusion in all scenes should be considered.

Digital media should be downloaded at least once each day.

Closeup and Feature Photography

When directed by the FTL, closeup photographs should include a standard reference marker of appropriate size as an indication of the feature size and contain a slate marked with the site name and any identifying label, such as a well number or core depth, that clearly communicates to the viewer the specific feature being photographed.

Feature samples, core pieces, and other lithologic media should be photographed as soon as possible after they have been removed from their in situ locations. This enables a more accurate record of their initial condition and color. When directed by the FTL, include a standard reference color strip (color chart such as Munsell Soil Color Chart or that available from Eastman Kodak Co.) within the scene. This is to be included for the benefit of the viewer of the photographic document and serves as a reference aid to the viewer for formal lithologic observations and interpretations.

Site Photography

Site photography, in general, will consist predominantly of medium and wide-angle shots. A standard reference marker should be placed adjacent to the feature or, when this is not possible, within the same focal plane.

While it is encouraged that a standard reference marker and caption/slate be included in the scene, it is understood that situations will arise that preclude their inclusion within the scene. This will be especially true of wide-angle shots. In such a case, the film/tape control number shall be entered in the photographic logbook along with the frame number and all other information pertinent to the scene.

Panoramic

In situations where a wide-angle lens does not provide sufficient subject detail, a single-use disposable panoramic camera is recommended. If this type of camera is not available, a panoramic series of two or three photos would be appropriate. Panoramas can provide greater detail while covering a wide subject, such as an overall shot of a site.

To shoot a panoramic series using a standard 35mm or digital camera, the following procedure is recommended.

- Use a stable surface or tripod to support the camera.
- Allow a 20 to 30 percent overlap while maintaining a uniform horizon.
- Complete 2 to 3 photos per series.

5.2.3 General Photographic Documentation Using Video Cameras

As a reminder, it is not within the scope of this document to set appropriate guidelines for presentation or "show" videotape recording. The following guidelines are set for documentary videotape recordings only and should be implemented at the discretion of the FTL.

Documentary videotape recordings of field activities may include an audio slate for all scenes. At the beginning of each video session, an announcer will recite the following information: date, time (in military units), photographer, site ID number, and site location. This oral account may include any additional information clarifying the subject matter being recorded.

A standard reference marker may be used when taking closeup shots of site features with a video camera. The scene may also include a caption/slate. It should be placed adjacent and parallel to the feature being photographed.

It is recommended that a standard reference marker and caption/slate be included in all scenes. The caption information is vital to the value of the documentary visual media and should be included. If it is not included within the scene, it should be placed before the scene.

Original videotape recordings will not be edited. This will maintain the integrity of the information contained on the videotape. If editing is desired, a working copy of the original videotape recording can be made.

5.2.4 Photographic Documentation

Photographic activities must be documented in a photographic logbook or in a section of the field logbook. The photographer will be responsible for making proper entries.

In addition to following the technical standards for logbook entry as referenced in CDM Federal SOP 4-1, the following information should be maintained in the appropriate logbook:

- Photographer name.
- If required, an entry shall be made for each new roll/tape control number assigned.
- Sequential tracking number for each photograph taken (for digital cameras, the camera-generated number may be used).
- Date and time (military time).
- Location.
- A description of the activity/item photographed.
- If needed, a description of the general setup, including approximate distance between the camera and the subject, may be recorded in the logbook.
- Record as much other information as possible to assist in the identification of the photographic document.

5.3 Post Operation

All film will be sent for development and printing to a photographic laboratory (to be determined by the photographer). The photographer will be responsible for arranging transport of the film from the field to the photographic laboratory. The photographer shall also be responsible for arranging delivery of the negatives and photographs, digital storage medium, or videotape to the project management representative.

5.3.1 Documentation

At the end of each day's photographic session, the photographer(s) will ensure that the appropriate logbook has been completely filled out and maintained as outlined in CDM Federal SOP 4-1.

5.3.2 Archive Procedures

1. Photographs and the associated set of negatives, digital media, and original unedited documentary videotape recordings will be submitted to the project files and handled according to contract records requirements. The FTL will ensure their proper distribution.

2. Completed pages of the appropriate logbook will be copied weekly and submitted to the project files.

6.0 RESTRICTIONS/LIMITATIONS

This document is designed to provide a set of guidelines for the field amateur or professional photographer to ensure that an effective and standardized program of visual documentation is maintained.

It is not within the scope of this document to provide instruction in photographic procedures, nor is it within the scope of this document to set guidelines for presentation or "show" photography.

The procedures outlined herein are general by nature. The FTL is responsible for specific operational activity or procedure. Questions concerning specific procedures or requirements should be directed to the FTL.

NOTE: Some sites do not permit photographic documentation. Check with the site contact for any restrictions.

7.0 REFERENCES

U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3*, February 2001, Appendix F.

U.S. Environmental Protection Agency, Region IV, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, Athens, Georgia, May 1996.

U.S. Environmental Protection Agency, National Enforcement Investigations Center, *Multi-Media Investigation Manual*, EPA-330/9-89-003-R, Revised March 1992, p. 85.

SOP 4-5

Field Equipment Decontamination at Nonradioactive Sites

Project-Specific Modification

SOP No.: 4-5

SOP Title: Field Equipment Decontamination at Nonradioactive Sites

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Client: U.S. Environmental Protection Agency

Project Manager: Jeff Montera Date: 5/8/02

Technical Reviewer: J. Montera for D. Schnoor Date: 5/8/02

QA Reviewer: [signature] Date: 5/8/02

EPA Approval: [signature] Date: 5/7/02

Reason for and duration of modification: Site-specific procedures for decontamination of Libby amphibole asbestos contaminated field equipment are different than CDM Technical SOP 4-5. These modifications are necessary for the entire duration of the project.

All equipment used to collect, handle, or measure soil samples will be decontaminated in accordance with CDM Technical SOP 4-5, Field Equipment Decontamination at Nonradioactive Sites, with the following modifications:

Section 4.0, Required Equipment - Plastic sheeting will not be used during decontamination procedures. American Society for Testing and Materials (ASTM) Type II water will not be used. Rather, locally available deionized (DI) water will be used.

Section 5.0, Procedures - Decontamination water will not be captured and will be discharged to the ground at the property.

Section 5.6, Waste Disposal - Decontamination water will not be captured and will not be packaged, labeled, or stored as investigation-derived waste (IDW).

FIELD EQUIPMENT DECONTAMINATION AT NONRADIOACTIVE SITES

Prepared: Steven Fundingsland

Technical Review: Darwin Nelson

QA Review: George DeLullo

Approved: [signature] 12/27/00
Signature/Date

Issued: Rose Mary Justin 12/29/00
Signature/Date

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to describe the procedures required for decontamination of field equipment.

2.0 BACKGROUND

2.1 Definitions

Clean - Free of visible contamination and when decontamination has been completed in accordance with this SOP.

Cross-Contamination - The transfer of contaminants through equipment or personnel from the contamination source to less contaminated or non-contaminated samples or areas.

Decontamination - The process of rinsing or otherwise cleaning the surfaces of equipment to rid them of contaminants and to minimize the potential for cross contamination of samples or exposure of personnel.

2.2 Discussion

Decontamination of field equipment is necessary to ensure the quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off-site.

3.0 RESPONSIBILITIES

Field Team Leader - The Field Team Leader (FTL) ensures that field personnel are trained in the performance of this procedure and that decontamination is conducted in accordance with this procedure. The FTL may also be required to collect and document rinsate samples to provide quantitative verification that these procedures have been correctly implemented.

4.0 REQUIRED EQUIPMENT

- Stiff-bristle scrub brushes
- Plastic buckets and troughs
- Laboratory-grade detergent (low phosphate)
- Nalgene or Teflon Sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayer (pump sprayer material must be compatible with the solution used)
- Plastic sheeting
- Disposable wipes, rags or paper towels
- Potable water and/or de-ionized water and/or American Society for Testing and Materials (ASTM) Type II or better, as defined by ASTM Standard Specification for Reagent Water, Standard D 1193-77 (re-approved 1983)*
- Gloves, safety glasses, and other protective clothing as specified in the site-specific health and safety plan
- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source (e.g. 10% and/or 1% nitric acid (HNO_3), acetone, methanol, isopropanol, hexane)
- Tools for equipment assembly and disassembly (as required)
- 55-gallon drums or tanks (as required)
- Pallets for drums or tanks holding decontamination water (as required)

* Potable, de-ionized, and ASTM Type II water may be required to be tested for contaminants before use. Check field plan for requirements.

5.0 PROCEDURES

All reusable equipment (non-dedicated) used to collect, handle, or measure samples will be decontaminated before coming into contact with any sample. Decontamination of equipment will occur either at the central decontamination station or at portable decontamination stations set up at the sampling location, drill sites, or monitoring well locations. The centrally located decontamination station will include an appropriately sized bermed area on which equipment decontamination will occur and shall be equipped with a collection system and storage vessels. In certain circumstances, berming is not required when small quantities of water are being generated and for some short duration field activities (i.e., pre-remedial sampling). Equipment should be transported to the decontamination station in a manner to prevent cross-contamination of equipment and/or area. Precautions taken may include enclosing augers in plastic wrap while being transported on a flatbed truck.

The decontamination area will be constructed so that contaminated water is either collected directly into appropriate containers (5-gallon buckets or steel wash tubs) or within the berms of the decontamination area which then drains into a collection system. Water from the collection system will be transferred into 55-gallon drums or portable tanks for storage. Typically, decontamination water will be staged until sampling results or waste characterization results are obtained and evaluated and the proper disposition of the waste is determined. The exact procedure for decontamination waste disposal should be discussed in the field plan. Also, decontamination fluids, such as solvents may need to be segregated from other investigation derived wastes.

All items that will come into contact with potentially contaminated media will be decontaminated before use and between sampling and/or drilling locations. If decontaminated items are not immediately used, they will be covered either with plastic or aluminum foil depending on the size of the item. All decontamination procedures for the equipment being used are as follows:

General Guidelines

- Potable and de-ionized water should be free of all contaminants of concern. Following the field plan, analytical data from the water source may be required. If required, either existing analytical data from the water source supplier (i.e., municipality, bottled water company, de-ionized water producer) may be obtained or chemical testing may be performed on the selected source.

- Soap will be a low phosphate detergent.

- Sampling equipment that has come into contact with oil and grease will be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Regulatory or client requirements will be stated in the field plan.

- Decontaminated equipment will be allowed to air dry before being used.

- Documentation for all cleaning will be recorded in the appropriate logbook.

- All solvents will be pesticide grade or better and traceable to a source. The corresponding lot numbers will be recorded in the appropriate logbook.

- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment will be used as specified in the site-specific health and safety plan.

5.1 Heavy Equipment Decontamination

Heavy equipment includes drilling rigs and backhoes. Follow these steps when decontaminating this equipment:

1. Establish a decontamination area with berms that is large enough to fully contain the equipment to be cleaned. If available, an existing wash pad or appropriate paved and bermed area may be utilized; otherwise, use one or more layers of heavy plastic sheeting to cover the ground surface and berms. All decontamination pads should be upwind of the area under investigation.

2. With the rig in place, spray areas (rear of rig or backhoe) exposed to contaminated soils using a hot water high-pressure sprayer. Be sure to spray down all surfaces, including the undercarriage.

3. Use brushes, low phosphate detergent and potable water to remove dirt whenever necessary.

4. Remove equipment from the decontamination pad and allow it to air dry before returning it to the work site.

5. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

6. After decontamination activities are completed, collect all contaminated wastewater, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal as detailed in the field plan. Liquids and solids must be drummed separately.

5.2 Downhole Equipment Decontamination

Downhole equipment decontamination includes hollow-stem augers, drill pipes, casings, screens, etc. Follow these steps when decontaminating this equipment:

1. Set up a centralized decontamination area, if possible. This area should be set up to collect contaminated rinse waters and to minimize the spread of airborne spray.

2. Set up a "clean" area upwind of the decontamination area to receive cleaned equipment for air-drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination pads should be upwind of any areas under investigation.

3. Place the object to be cleaned on aluminum foil or plastic-covered wooden sawhorses or other supports.

4. Using low phosphate detergent and potable water in the hot water high-pressure sprayer (or steam unit), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.

5. If using soapy water, rinse the equipment using clean, potable water. If using hot water, the rinse step is not necessary if the hot water does not contain a detergent. If the hot water contains a detergent, this final clean water rinse is required.

6. Using the manual-pump sprayer, rinse the equipment thoroughly with de-ionized water (ASTM Type II or better).

7. Remove the equipment from the decontamination area and place in a clean area upwind to air dry.

8. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

9. After decontamination activities are completed, collect all contaminated wastewaters, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal. Liquids and solids must be drummed separately.

5.3 Sampling Equipment Decontamination

Sampling equipment includes split spoons, spatulas, and bowls used for sample homogenization that directly contact sample media. Follow these steps when decontaminating this equipment:

1. Set up a decontamination line on plastic sheeting. The decontamination line should progress from "dirty" to "clean" and have an area located upwind for drying decontaminated equipment. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or the surfaces on which decontaminated equipment is to be placed for drying.

2. Before washing, disassemble any items that might trap contaminants internally. Do not reassemble these items until decontamination and air-drying are complete. Wash items thoroughly in a bucket of low phosphate detergent and potable water. Use a stiff-bristle brush to dislodge any gross contamination (soil or debris).

3. Rinse the item in potable water. Rinse water should be replaced as needed, generally when cloudy.

4. Using a hand sprayer, wash bottles, or manual-pump sprayer, rinse the item with de-ionized water (ASTM Type II or better).

5. If required by the site-specific field plans, rinse the item with 10% nitric acid (for stainless steel, glass, plastic, and Teflon), or 1% nitric acid (for items made of low-carbon steel) followed by a de-ionized water (ASTM Type II or better) rinse.

   NOTE: Care should be taken not to get nitric acid on skin or clothing. This step should not be used unless required by sampling needs as dictated in the field plan.

   CAUTION: Do not allow nitric acid to contact methanol or hexane. Contain nitric acid waste separate from organic solvents.

6. If sampling for organic analytes, rinse the item with methanol or approved organic solvent.

7. Rinse the item with de-ionized water (ASTM Type II or better).

8. If required by the field plan, when sampling for polar organic compounds such as pesticides, polychlorinated biphenyls (PCBs), and fuels, rinse the item with hexane or approved alternatives, followed by a second methanol rinse.

9. Allow the item to air dry completely.

10. After drying, wrap the clean item in plastic wrap or in aluminum foil, shiny side out.

11. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

12. After decontamination activities are completed, collect all contaminated waters, used solvents and acids, plastic sheeting, and disposable gloves, boots, and clothing. Place contaminated items in properly labeled drums for disposal. Liquids and solids must be drummed separately. (Refer to site-specific plans for labeling and waste management requirements).

5.4 Pump Decontamination

Follow the manufacturer's recommendation for specified pump decontamination procedures. At a minimum follow these steps when decontaminating pumps:

1. Set up the decontamination area and separate "clean" storage area using plastic sheeting to cover the ground, tables, and other porous surfaces. Set up three 55-gallon drums and one or more containers of ASTM Type II water (or as specified in the field plan) with one drum containing dilute (non-foaming) soapy water, the second drum containing potable water, and the third drum receiving waste water.

2. The pump should be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first drum. Place the discharge outlet in the wastewater drum above the level of the wastewater. Pump soapy water through the pump assembly until it discharges to the waste drum.

3. Move the pump assembly to the potable water drum while leaving discharge outlet in the waste drum. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.

4. Move the pump intake to the ASTM Type II water can. Pump the ASTM Type II water through the pump assembly. Usually, three pump-and-line-assembly volumes will be required.

5. Decontaminate the discharge outlet by hand following the steps outlined in Section 5.3.

6. Remove the decontaminated pump assembly to the "clean" area and allow it to air dry upwind of the decontamination area. Intake and outlet orifices should be covered with aluminum foil to prevent the entry of airborne contaminants and particles.

7. Record the equipment type, serial number, date, time, and method of decontamination in the appropriate logbook.

5.5 Instrument Probe Decontamination

Instrument probes used for field instruments such as pH meters, conductivity meters etc. will be decontaminated between samples and after use with ASTM type II, or better, water.

5.6 Waste Disposal

Refer to site-specific plans for waste disposal requirements. The following are guidelines for disposing of wastes:

1. All wash water, rinse water, and decontamination solutions that have come in contact with contaminated equipment are to be handled, packaged, labeled, marked, stored, and disposed of as investigation-derived waste.

2. Small quantities of decontamination solutions may be allowed to evaporate to dryness.

3. If large quantities of used decontamination solutions will be generated, it may be best to separate each type of waste in a separate container. This may permit the disposal of wash water and rinse water onsite or in a sanitary sewage treatment plant rather than as a hazardous waste. If an industrial wastewater treatment plant is available onsite, the disposal of acid solutions and solvent-water solutions may be permitted.

4. Unless otherwise required, plastic sheeting and disposable protective clothing may be treated as a solid, non-hazardous waste.

6.0 RESTRICTIONS/LIMITATIONS

Nitric acid and polar solvent rinses are necessary only when sampling for metals or organics respectively. These steps should not be used, unless required, because of acid burn and ignitability hazards.

If the field equipment is not allowed to air dry properly before use, volatile organic residue which interferes with the analysis may be detected in the samples. The occurrence of residual organic solvents is often dependent on the time of year sampling is conducted; in the summer, volatilization is rapid and in the winter, volatilization is slow. Check with your EPA region, state and client for approved decontamination solvents.

7.0 REFERENCES

Department of Energy, Hazardous Waste Remedial Actions Program, *Standard Operating Procedures For Site Characterization*, DOE/HWP-100/R1, September 1996.

Department of Energy, Hazardous Waste Remedial Actions Program, *Quality Control Requirements For Field Methods*, DOE/HWP-69/R2, September 1996.

American Society for Testing and Materials, *Standard Practice for Decontamination of Field Equipment at Nonradioactive Waste Sites*, ASTM D5088-90, June 29, 1990.

U.S. Environmental Protection Agency, Region II, "*CERCLA" Quality Assurance Manual*, Revision 1, 1989.

U.S. Environmental Protection Agency, Region IV, *Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual*, 1986.

U.S. Environmental Protection Agency, *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.1, 1987.

CDM-LIBBY-01

Data Validation of Asbestos Results Obtained by Reflectance Spectroscopy

Site-Specific Standard Operating Procedure for Data Validation of Asbestos Results Obtained by Reflectance Spectroscopy for the Contaminant Screening Study of the Libby Asbestos Project

SOP No: CDM-LIBBY-01

Project: Libby Asbestos Remedial Investigation – Contaminant Screening Study (CSS)

Project Number: 3282-116

Prepared by: Dee Warren — 4/3/02
Environmental Specialist — Date

Approved by: Jeff Montera — 5/8/02
Project Manager — Date

G. Montera for D. Schroeder — 5/8/02
Technical Reviewer — Date

5/8/02
QA Reviewer — Date

5/7/02
EPA Approval — Date

The following procedures for data validation are based on the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Data Review (EPA 1994) and Standard Operating Procedure (SOP) No. ISSI-LIBBY-02, Reflectance Spectroscopy Screening for Asbestos in Soil (U.S. Geological Survey [USGS] 2002). These procedures will be used in the data validation process for results gathered as part of the contaminant screening study (CSS) of the Libby Asbestos Project.

This is a working document and applicable changes will be made as the validation procedure is implemented. The criteria that are specified in this SOP are only default preliminary goals and will be modified as the data validation process is implemented. Currently precision and accuracy goals for bulk soil analysis of LAA by IR and SEM are untested and therefore unavailable. Frequency of QC sample collection and analytical precision and accuracy criteria provided here are taken from more standard inorganic EPA methods. We recognize that these goals may require adjustment as data are generated for the methods used at Libby. Precision and accuracy criteria will be derived for method-specific and Libby site soils using control charting and standard procedures outlined in the SW-846. Further, recommended frequencies for the QC samples prescribed here may be adjusted as we gain information about the variability of samples at Libby.

Section 1
Instrument Calibration and Standardization

1.1 Instrument Calibration

Calibration must be successfully completed at the beginning of each sample analysis run and repeated according to the manufacturer's recommendations or when instrument drift is detected. Calibration procedures are described in the manufacturer's operating manual for both wavelength and intensity. If the laboratory has failed to provide adequate calibration information, the designated representative should contact the laboratory and request the necessary information.

Evaluation: Verify calibration was performed at the proper frequency.

Action: Minimum frequency was not met; qualify the data as unusable (R).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions.

1.2 Continuing Calibration

An independent reference material must be analyzed for wavelength and intensity with each analytical batch or once a day, whichever is more frequent. An analytical batch is comprised of 20 field samples. The acceptable percent recovery (%R) for continuing calibration criteria is between 80 and 120%R. %R is calculated by the following:

$$\%R = \frac{\text{Measured}}{\text{Actual}} \times 100$$

Where: Measured = result of asbestos (percent weight) measured in the reference material

Actual = result of asbestos (percent weight) in the reference material

Evaluation: Verify continuing calibration was performed at the required frequency for both wavelength and intensity.

Action: Calibration was not performed on a daily basis; qualify the data as unusable (R).

Action: Calibration was performed on the day of sample analysis, but not once per sample batch; qualify the data as estimated (J).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions. If the calibration was performed on the day of sample analysis but not per sample batch the accuracy of the results can not be verified and the data user should consider the results estimated.

Evaluation: Verify continuing calibration is between 80 and 120%R for both wavelength and intensity.

Action:

%R	Detected Results Qualifier	Nondetected Results Qualifier	Purpose of Qualifier
65-79%	J v	UJ v	A slightly low biased QA sample indicate the sample results may be biased low.
121-135%	J ^	UJ^	A slightly high biased QA sample indicate the sample results may be biased high.
<65%	R unless >1% then no qualifier required	R	Significantly low biased QA samples indicate the sample results may be significantly biased low. Removal decisions should not be made using the data.
>135%	J ^+	UJ^+	Significantly high biased QA samples indicate the sample results may be significantly high biased.

1.3 Spectra Standardization

All spectra must be fully corrected to absolute reflectance before any analysis can be performed.

Evaluation: Verify standardization was performed at the proper frequency.

Action: Standardization was not performed; qualify the data as unusable (R).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions.

Section 2
Method Blanks

An instrument blank is composed of the field sample matrix that is free of the analyte of interest (e.g., asbestos-free soil). Method blanks are put through the same sample preparation steps as field samples and are used to discern if laboratory-induced contamination is present. All associated samples may require re-preparation and re-analysis. Method blanks must be analyzed with each analytical batch or once a day, whichever is more frequent. An analytical batch is comprised of 20 field samples.

Evaluation: Verify method blank analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Qualify results at or below the level detected in the method blank.

Action: All detected results less than or equal to the level detected in the method blank qualify as estimated (U).

Purpose of qualifier: Contamination present in the method blank implies samples analyzes with the method blank may also be contaminated from the laboratory handling process.

Section 3
Laboratory Control Sample (LCS)

Laboratory control samples are certified reference standards (independent from the calibration standards), consisting of several asbestos minerals. Because LCSs are independent of the calibration standards, they are analyzed to verify the accuracy of the standards used to calibrate the instrument for wavelength and intensity. An LCS must be analyzed with each analytical batch or once a day, whichever is more frequent. The LCS will be evaluated on accurate asbestos mineral identification. The acceptable %R for LCS criteria is between 80 and 120%R. %R is calculated by the following:

$$\%R = \frac{\text{Measured}}{\text{Actual}} \times 100$$

Where: Measured = result of asbestos (percent weight) measured in the LCS

Actual = result of asbestos (percent weight) in the LCS source

Evaluation: Verify continuing calibration was performed at the required frequency for both wavelength and intensity.

Action: Calibration was not performed on a daily basis; qualify the data as unusable (R).

Action: Calibration was performed on the day of sample analysis, but not once per sample batch; qualify the data as estimated (J).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions. If the calibration was performed on the day of sample analysis but not per sample batch the accuracy of the results can not be verified and the data user should consider the results estimated.

Evaluation: Verify continuing calibration is between 80 and 120%R for both wavelength and intensity.

Action:

%R	Detected Results Qualifier	Nondetected Results Qualifier	Purpose of Qualifier
65-79%	J v	UJ v	A slightly low biased QA sample indicate the sample results may be biased low.
121-135%	J ^	UJ^	A slightly high biased QA sample indicate the sample results may be biased high.
<65%	R unless >1% then no qualifier required	R	Significantly low biased QA samples indicate the sample results may be significantly biased low. Removal decisions should not be made using the data.
>135%	J ^+	UJ^+	Significantly high biased QA samples indicate the sample results may be significantly high biased.

Section 4
Duplicate Sample Analysis

4.1 Laboratory Duplicate Samples

Laboratory duplicate samples are splits of a well-homogenized sample that is prepared by the laboratory personnel. Because the laboratory is aware that the samples are duplicates, these samples serve to test the precision of the laboratory's sample preparation and analysis. A laboratory duplicate should be performed at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a laboratory duplicate is a relative percent difference (RPD) less than or equal to 35 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than two times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify laboratory duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation*:* Verify RPD [35 percent, or difference is less than two times the reporting limit, whichever is applicable.

Action*:* RPD > 35 percent, or difference is greater than two times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the laboratory duplicate criteria are not met, the result is estimated because the laboratory analysis method is not precise. Therefore the accuracy of the value is unknown.

4.2 Field Duplicate Samples

Field duplicate samples are co-located soil samples that are collected by the field personnel, but the laboratory is unaware that the samples are duplicates. These samples serve to test the precision of both the field sampling and the laboratory's sample preparation and analysis. A field duplicate should be collected at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a field duplicate is an RPD less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify field duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Verify RPD [50 percent, or difference is less than four times the reporting limit, whichever is applicable.

Action: RPD > 50 percent, or difference is greater than four times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the field duplicate criteria are not met, the result is estimated because the sample collection method is not precise. Therefore the accuracy of the value is unknown.

4.3 Preparation Duplicate Samples

Preparation duplicate samples are splits of samples submitted for sample preparation prior to laboratory analysis. These samples serve to test the precision of both the sample preparation personnel and the laboratory's sample preparation and analysis. A preparation duplicate sample should be submitted at a frequency of 5 percent of the first 500 field samples prepared for analysis or one per preparation batch, whichever is more frequent. The acceptable criteria for a field duplicate is an RPD less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit. If the average RPD for the first 500 samples is [50 percent, preparation duplicate sample analysis will not continue. If the average RPD for the first 500 samples is >50 percent, preparation duplicate sample analysis will continue at a rate of 2 percent for the remainder of the project. The frequency of the submission of preparation duplicate samples may be further reduced as initial information about the homogeneity of samples is understood.

Evaluation: Verify preparation duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Verify RPD [50 percent, or difference is less than four times the reporting limit, whichever is applicable.

Action: RPD > 50 percent, or difference is greater than four times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the preparation duplicate criteria are not met, the result is estimated because the sample preparation method is not precise. Therefore the accuracy of the value is unknown.

4.3 IR and SEM Sample Splits

Selected field samples will be analyzed by both infrared spectroscopy (IR) and scanning electron microscopy (SEM) methods. The sample results will be compared to determine if the IR results and SEM results are within an acceptable RPD range. The acceptable criteria for a laboratory duplicate is an RPD less than or equal to 35 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than two times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify RPD [35 percent, or difference is less than two times the reporting limit.

Action: Field samples should not be qualified based on duplicate results alone. RPD > 35 percent or difference is greater than two times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the SEM/IR split criteria are not met, the result is estimated because the analytical method is not precise. Therefore the accuracy of the value is unknown.

Section 5
Field Equipment Blank and Rinsate Samples

Field equipment blanks and rinsates samples are collected to determine if decontamination procedures of field equipment used to collect asbestos samples are adequate to prevent cross-contamination of samples during sample collection. Field equipment blank samples are collected at the end of each day.

Evaluation: Verify field equipment blanks and rinsate sample analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation Qualify results at or below the level detected in the field equipment blanks and rinsate sample.

Action: All detected results less than or equal to the level detected in the field equipment blanks and rinsate sample qualify as estimated (U).

Purpose of qualifier: Contamination present in the field equipment blanks and rinsate sample implies samples may also be contaminated from the field handling process.

Section 6
Preparation Laboratory Equipment Blanks

Laboratory equipment blanks samples are collected to determine if decontamination procedures of laboratory equipment used to prepare asbestos samples are adequate to prevent cross-contamination of samples during sample preparation. Laboratory equipment blanks will be collected at the end of each day of sample preparation from equipment used to prepare samples for asbestos analysis. These samples will be collected using silica sand that is asbestos free as analyzed by IR. The frequency of laboratory equipment blank sample collection may be adjusted, as the relationship between cross-contamination and sample results is understood.

Evaluation: Verify laboratory equipment blank sample analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation Qualify results at or below the level detected in the equipment blanks and sample.

Action: All detected results less than or equal to the level detected in the equipment blanks sample qualify as estimated (U).

Purpose of qualifier: Contamination present in the equipment blank sample implies samples may also be contaminated from the laboratory handling process.

CDM-LIBBY-02

Data Validation of Asbestos Results Obtained by Scanning Electron Microscopy

Site-Specific Standard Operating Procedure for Data Validation of Asbestos Results Obtained by Scanning Electron Microscopy for the Contaminant Screening Study of the Libby Asbestos Project

SOP No: CDM-LIBBY-02

Project: Libby Asbestos Remedial Investigation – Contaminant Screening Study (CSS)

Project Number: 3282-116

Prepared by: Dee Warren — 3/28/02
Environmental Specialist — Date

Approved by: [signature] — 5/8/02
Project Manager — Date

[signature] for D. Schroeder — 5/8/02
Technical Reviewer — Date

[signature] — 5/8/02
QA Reviewer — Date

[signature] — 5/7/02
EPA Approval — Date

The following procedures for data validation are based on the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Data Review (EPA 1994) and EPA Standard Operating Procedure (SOP) No. EPA-LIBBY-01, Asbestos Analysis of Soils by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy (EPA 2000). These procedures will be used in the data validation and evaluation process for results gathered as part of the contaminant screening study (CSS) of the Libby Asbestos Project.

> This is a working document and applicable changes will be made as the validation procedure is implemented. The criteria that are specified in this SOP are only default preliminary goals and will be modified as the data validation process is implemented. Currently precision and accuracy goals for bulk soil analysis of LAA by IR and SEM are untested and therefore unavailable. Frequency of QC sample collection and analytical precision and accuracy criteria provided here are taken from more standard inorganic EPA methods. We recognize that these goals may require adjustment as data are generated for the methods used at Libby. Precision and accuracy criteria will be derived for method-specific and Libby site soils using control charting and standard procedures outlined in the SW-846. Further, recommended frequencies for the QC samples prescribed here may be adjusted as we gain information about the variability of samples at Libby.

Section 1
Calibration Criteria
1.1 Initial Calibration

The scanning electron microscope (SEM) is calibrated with four standards at the following minimum frequency: (1) prior to receipt of samples, (2) monthly after first calibration, and (3) after any maintenance. Data packages will be checked to ensure that the following initial calibration standards are met and performed at the required frequency. Initial calibration consists of: magnification calibration, peak centroid calibration, resolution calibration, and sodium sensitivity. If the laboratory has failed to provide adequate calibration information, the designated representative should contact the laboratory and request the necessary information.

Evaluation: Verify initial calibration was performed at the proper frequency.

Action: Minimum frequency was not met; qualify the data as unusable (R).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions.

1.1.1 Magnification Calibration

The magnification calibration should fall within 10 percent of the certified values as indicated in the calibration standard manufacturer's specifications. The results of this calibration are recorded on the data collection logsheet.

Evaluation: Verify magnification calibration is within 10 percent of the certified values.

Action: If not performed or doesn't meet the criteria outlined above, the validator must: 1) contact the lab for clarification; 2) if no clerical or similar error can be determined, contact EPA. Since this is a new method, EPA may want to investigate the issue(s).

1.1.2 Peak Centroid Calibration

The aluminum centroid peak should be should be performed in accordance with the manufacturer's specifications. These specifications and the acceptable criteria should be included in each data package.

Evaluation: Verify peak centroid calibration is within the instrument specific criteria

Action: If not performed or doesn't meet the criteria outlined above, the validator must: 1) contact the lab for clarification; 2) if no clerical or similar error can be determined, contact EPA. Since this is a new method, EPA may want to investigate the issue(s).

1.1.3 Resolution Calibration

The resolution calibration should be performed in accordance with the manufacturer's specifications. These specifications and the acceptable criteria should be included in each data package.

Evaluation: Verify resolution calibration is within the instrument specific criteria.

Action: If not performed or doesn't meet the criteria outlined above, the validator must: 1) contact the lab for clarification; 2) if no clerical or similar error cannot be determined, contact EPA. Since this is a new method, EPA may want to investigate the issue(s).

1.1.4 Sodium Sensitivity

The sodium sensitivity calibration should be performed in accordance with the manufacturer's specifications. These specifications and the acceptable criteria should be included in each data package.

Evaluation: Verify calibration was performed and reported

Action: If not performed the validator must: 1) contact the lab for clarification; 2) if no clerical or similar error cannot be determined, contact EPA. Since this is a new method, EPA may want to investigate the issue(s).

1.2 Continuing Calibration

An independent laboratory control sample (LCS) must be analyzed with each analytical batch or once a day, whichever is more frequent. An analytical batch is comprised of 20 field samples. The acceptable percent recovery (%R) for continuing calibration criteria is between 80 and 120%R. %R is calculated by the following:

$$\%R = \frac{\text{Measured}}{\text{Actual}} \times 100$$

Where: Measured = result of asbestos (percent weight) measured in the LCS

Actual = result of asbestos (percent weight) in the LCS source

Action: Calibration was not performed on a daily basis; qualify the data as unusable (R).

Action: Calibration was performed on the day of sample analysis, but not once per sample batch; qualify the data as estimated (J).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions. If the calibration was performed on the day of sample analysis but not per sample batch the accuracy of the results can not be verified and the data user should consider the results estimated.

Evaluation: Verify continuing calibration is between 80 and 120%R for both wavelength and intensity.

Action:

%R	Detected Results Qualifier	Nondetected Results Qualifier	Purpose of Qualifier
65-79%	J v	UJ v	A slightly low biased QA sample indicate the sample results may be biased low.
121-135%	J ^	UJ^	A slightly high biased QA sample indicate the sample results may be biased high.
<65%	R unless >1% then no qualifier required	R	Significantly low biased QA samples indicate the sample results may be significantly biased low. Removal decisions should not be made using the data.
>135%	J ^+	UJ^+	Significantly high biased QA samples indicate the sample results may be significantly high biased.

Section 2
Method Blanks

An instrument blank is composed of the field sample matrix that is free of the analyte of interest (e.g., asbestos-free soil). Method blanks are put through the same sample preparation steps as field samples and are used to discern if laboratory-induced contamination is present. All associated samples may require re-preparation and re-analysis. Method blanks must be analyzed with each analytical batch or once a day, whichever is more frequent. An analytical batch is comprised of 20 field samples.

Evaluation: Verify method blank analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Qualify results at or below the level detected in the method blank.

Action: All detected results less than or equal to the level detected in the method blank qualify as estimated (U).

Purpose of qualifier: Contamination present in the method blank implies samples analyzes with the method blank may also be contaminated from the laboratory handling process.

Section 3
Laboratory Control Sample (LCS)

Laboratory control samples are certified reference standards (independent from the calibration standards), consisting of several asbestos minerals. Because LCSs are independent of the calibration standards, they are analyzed to verify the accuracy of the standards used to calibrate the instrument. An LCS must be analyzed with each analytical batch or once a day, whichever is more frequent. The LCS will be evaluated on accurate asbestos mineral. The acceptable percent recovery (%R) for continuing calibration criteria is between 80 and 120%R. %R is calculated by the following:

$$\%R = \frac{\text{Measured}}{\text{Actual}} \times 100$$

Where: Measured = result of asbestos (percent weight) measured in the LCS

Actual = result of asbestos (percent weight) in the LCS source

Evaluation: Verify continuing calibration was performed at the required frequency for both wavelength and intensity.

Action: Calibration was not performed on a daily basis; qualify the data as unusable (R).

Action: Calibration was performed on the day of sample analysis, but not once per sample batch; qualify the data as estimated (J).

Purpose of qualifier: If no evidence of calibration exists, the validator must assume the instrument was not calibrated, and therefore the data user should not use the generated data to make decisions. If the calibration was performed on the day of sample analysis but not per sample batch the accuracy of the results can not be verified and the data user should consider the results estimated.

Evaluation: Verify continuing calibration is between 80 and 120%R for both wavelength and intensity.

Action:

%R	Detected Results Qualifier	Nondetected Results Qualifier	Purpose of Qualifier
65-79%	J v	UJ v	A slightly low biased QA sample indicate the sample results may be biased low.
121-135%	J ^	UJ^	A slightly high biased QA sample indicate the sample results may be biased high.
<65%	R unless >1% then no qualifier required	R	Significantly low biased QA samples indicate the sample results may be significantly biased low. Removal decisions should not be made using the data.
>135%	J ^+	UJ^+	Significantly high biased QA samples indicate the sample results may be significantly high biased.

Section 4
Duplicate Sample Analysis
4.1 Laboratory Duplicate Samples

Laboratory duplicate samples are splits of a well-homogenized sample that is prepared by the laboratory personnel. Because the laboratory is aware that the samples are duplicates, these samples serve to test the precision of the laboratory's sample preparation and analysis. A laboratory duplicate should be performed at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a laboratory duplicate is a relative percent difference (RPD) less than or equal to 35 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than two times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify laboratory duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation*:* Verify RPD [35 percent, or difference is less than two times the reporting limit, whichever is applicable.

Action: RPD > 35 percent, or difference is greater than two times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the laboratory duplicate criteria are not met, the result is estimated because the laboratory analysis method is not precise. Therefore the accuracy of the value is unknown.

4.2 Field Duplicate Samples

Field duplicate samples are co-located soil samples that are collected by the field personnel, but the laboratory is unaware that the samples are duplicates. These samples serve to test the precision of both the field sampling and the laboratory's sample preparation and analysis. A field duplicate should be collected at a frequency of 5 percent of all field samples prepared for analysis (one laboratory duplicate for every 20 field samples) or one per preparation batch, whichever is more frequent. The acceptable criteria for a field duplicate is an RPD less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify field duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Verify RPD [50 percent, or difference is less than four times the reporting limit, whichever is applicable.

Action: RPD > 50 percent, or difference is greater than four times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the field duplicate criteria are not met, the result is estimated because the sample collection method is not precise. Therefore the accuracy of the value is unknown.

4.3 Preparation Duplicate Samples

Preparation duplicate samples are splits of samples submitted for sample preparation prior to laboratory analysis. These samples serve to test the precision of both the sample preparation personnel and the laboratory's sample preparation and analysis. A preparation duplicate sample should be submitted at a frequency of 5 percent of the first 500 field samples prepared for analysis or one per preparation batch, whichever is more frequent. The acceptable criteria for a field duplicate is an RPD less than or equal to 50 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than four times the reporting limit when either sample result is <5 times the reporting limit. If the average RPD for the first 500 samples is [50 percent, preparation duplicate sample analysis will not continue. If the average RPD for the first 500 samples is >50 percent, preparation duplicate sample analysis will continue at a rate of 2 percent for the remainder of the project. The frequency of the submission of preparation duplicate samples may be further reduced as initial information about the homogeneity of samples is understood.

Evaluation: Verify preparation duplicate sample analysis was performed at the required frequency.

Action: Field samples should not be qualified based on duplicate results alone. The validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation: Verify RPD [50 percent, or difference is less than four times the reporting limit, whichever is applicable.

Action: RPD > 50 percent, or difference is greater than four times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the preparation duplicate criteria are not met, the result is estimated because the sample preparation method is not precise. Therefore the accuracy of the value is unknown.

4.4 IR and SEM Sample Splits

Selected field samples will be analyzed by both infrared spectroscopy (IR) and scanning electron microscopy (SEM) methods. The sample results will be compared to determine if the IR results and SEM results are within an acceptable RPD range. The acceptable criteria for a laboratory duplicate is an RPD less than or equal to 35 percent when both results are >5 times the reporting limit, or the difference between the duplicate and the original is less than two times the reporting limit when either sample result is <5 times the reporting limit.

Evaluation: Verify RPD [35 percent, or difference is less than two times the reporting limit.

Action: Field samples should not be qualified based on duplicate results alone. RPD > 35 percent or difference is greater than two times the reporting limit; qualify all results as estimated (J).

Purpose of qualifier: If the SEM/IR split criteria are not met, the result is estimated because the analytical method is not precise. Therefore the accuracy of the value is unknown.

Section 5
Field Equipment Blank and Rinsate Samples

Field equipment blanks and aqueous rinsates samples are collected to determine if decontamination procedures of field equipment used to collect asbestos samples are adequate to prevent cross-contamination of samples during sample collection. Field equipment blank samples are collected at the end of each day. The laboratory will report aqueous rinsate results as fiber counts and a percent by weight.

Evaluation: Verify field equipment blanks and rinsate sample analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation Qualify results at or below the level detected in the field equipment blanks and rinsate sample.

Action*:* All detected results less than or equal to the level detected in the field equipment blanks and rinsate sample qualify as estimated (U).

Purpose of qualifier: Contamination present in the field equipment blanks and rinsate sample implies samples may also be contaminated from the field handling process.

Section 6
Preparation Laboratory Equipment Blanks

Laboratory equipment blanks samples are collected to determine if decontamination procedures of laboratory equipment used to prepare asbestos samples are adequate to prevent cross-contamination of samples during sample preparation. Laboratory equipment blanks will be collected at the end of each day of sample preparation from equipment used to prepare samples for asbestos analysis. These samples will be collected using silica sand that is asbestos free as analyzed by IR. The frequency of laboratory equipment blank sample collection may be adjusted, as the relationship between cross-contamination and sample results is understood.

Evaluation: Verify laboratory equipment blank sample analysis was performed at the required frequency.

Action: Minimum frequency was not met; the validator should use professional judgment to determine if the associated sample results should be qualified.

Evaluation Qualify results at or below the level detected in the equipment blanks and sample.

Action: All detected results less than or equal to the level detected in the equipment blanks sample qualify as estimated (U).

Purpose of qualifier: Contamination present in the equipment blank sample implies samples may also be contaminated from the laboratory handling process.

CDM-LIBBY-03
Completion of Field Sample Data Sheets

Completion of Field Sample Data Sheets

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Document No.: CDM-LIBBY-03

Project Manager: Jeff Montera Date: 5/8/02

Technical Reviewer: J. Montera for D Schuessler Date: 5/8/02

EPA Approval: Mary Goldade Date: 5/7/02

A field sample data sheet (FSDS) must be completed using the following guidance.

Definitions:

Owner - person who owns a residential property (may or may not be the current occupant), or the person who owns a commercial property.

Sample Coordinator - person responsible for the custody of all field paper work and samples collected

Field Sample Data Sheet for Soil

Sheet No.: Pre-assigned unique sequential sheet number. Completed by sample coordinator.

Scenario No.: Scenario numbers are specific to the Phase II sampling program and do not apply to the CSS. "NA" should be placed in this blank.

Field Logbook No.: The logbook number being used to record information specific to the samples on the FSDS.

Page No.: Page number in logbook on which information regarding the samples on the FSDS is recorded.

Sampling Date: Date samples are collected, in the form MM/DD/YY.

Address: The address of the property being sampled. Addresses are to be entered in the following format:

Street number - Direction - Street Name - Street Abbreviation

Completion of Field Sample Data Sheets

Where:
Street number = the number of the street address
Direction = the abbreviation of the street direction (N, S, E, or W), when applicable
Street name = correct spelling of the street name
Street abbreviation = when applicable

Road - Rd
Avenue - Ave
Street - St
Circle - Cr
Place - Pl
Boulevard - Blvd
Highway - Hwy

Examples: 510 N Mineral Ave
607 N Michigan Ave
521 Pipe Creek Rd

Owner: Name of the property owner (not necessarily the current occupant).

Land Use: Description of land use on which property is located.

Sampling Team: Company affiliation of sampling team.

Names: Full name of all members of the sampling team.

Index ID: Sample identification (ID) number. Index ID numbers for the CSS are in the form CSS-#####. A set of available numbers is assigned to each sampling team by the sample coordinator.

Location ID: Unique identification number assigned to each sample location with a unique global positioning system (GPS) coordinate. For soil samples, location identifications (IDs) are in the form SP-#####. A set of available numbers is assigned to each sampling team by the sample coordinator.

Sample Group: The sample group for soil samples collected for the CSS must be one of the following options:

Yard
Garden
Driveway
Road
Flower Bed
Field
Walkway
Park
School

Completion of Field Sample Data Sheets

Location Description: Description of the location where a soil sample was collected. If back yard, front yard, or side yard do not apply, use the other blank.

Category: FS = field sample and FD = field duplicate. The field duplicate blank should be used to identify the FD of the parent FS.

Matrix Type: The samples collected for the CSS will mostly be surface samples (0 to 1 or 0 to 6 inches). If a sample that is collected is not a surface sample, complete the other line using the following options: mining waste, subsurface soil, fill.

Type: Indicate the type of sample collected, grab or composite. If the sample is a composite sample, the number of subsamples must be provided.

Time: The time of sample collection, in military time.

Top Depth: Top depth of sample in inches below the ground surface.

Bottom Depth: Bottom depth of sample in inches below the ground surface.

Grid, Quadrant, Section: Specific to the grid, quadrant, and section the sample is collected in. Entry should follow the example below:

45C3

Where:

45 = Grid number
C = Quadrant letter
3 = Section number

05A1

Where:

05 = Grid number
A = Quadrant letter
1 = Section number

Field Comments: Any information specific to a sample. If vermiculite is present, this must be noted in the field comments section.

Entered: Completed at time of data entry.

Validated: Completed at time of validated data receipt.

Completed by: Initials of field team member that completes the FSDS.

QC by: Initials of field team member that completes QC check of FSDS.

Completion of Field Sample Data Sheets

Field Sample Data Sheet for Water

Water samples collected for the CSS will be rinsate samples. The field data sheet should be completed using the following guidelines.

Sheet No.: Pre-assigned unique sequential sheet number. Completed by sample coordinator.

Scenario No.: Scenario numbers are specific to the Phase II sampling program and do not apply to the CSS. "NA" should be placed in this blank.

Field Logbook No.: The logbook number being used to record information specific to the samples on the FSDS.

Page No.: Page number in logbook on which information regarding the samples on the FSDS is recorded.

Sampling Date: Date samples are collected, in the form MM/DD/YY.

Address: Does not apply to rinsate samples. Place NA in blank.

Owner: Does not apply to rinsate samples. Place NA in blank.

Land Use: Does not apply to rinsate samples. Place NA in blank.

Sampling Team: Company affiliation of sampling team.

Names: Full name of all members of the sampling team.

Index ID: Sample identification number. A set of available numbers is assigned to each sampling team by the sample coordinator.

Location ID: Does not apply to rinsate samples. Place NA in blank.

Sample Group: Does not apply to rinsate samples. Place NA in blank.

Location Description: Does not apply to rinsate samples. Place NA in blank.

Category: FS = field sample and FD = field duplicate. All rinsate samples are field samples.

Matrix Type: Chose rinsate.

Completion of Field Sample Data Sheets

Field Comments: Any information specific to a sample.

Entered: Completed at time of data entry.

Validated: Completed at time of validated data receipt.

Completed by: Initials of field team member that completes the FSDS.

QC by: Initials of field team member that completes QC check of FSDS.

Sheet No.: CSS (S) - __________

CONTAMINANT SCREENING STUDY

FIELD SAMPLE DATA SHEET FOR SOIL

Scenario No.: ________ Field Logbook No: ___________ Page No: _______ Sampling Date: ________

Address: ______________________________ Owner: ______________________________

Land Use: (circle) Residential School Commercial Mining Roadway Other ( )

Sampling Team: (circle) CDM PES Other _______ Names: ______________________

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Location ID			
Sample Group			
Location Description (circle)	Back yard Front yard Side yard Other ____________	Back yard Front yard Side yard Other ____________	Back yard Front yard Side yard Other ____________
Category (circle)	FS FD________	FS FD________	FS FD ________
Matrix Type (Surface soil unless other wise noted)	Surface Soil Other ____________	Surface Soil Other ____________	Surface Soil Other ____________
Type (circle)	Grab Comp. # subsamples ____	Grab Comp. # subsamples ____	Grab Comp. # subsamples ____
Sample Time			
Top Depth (in.)			
Bottom Depth (in.)			
Grid, Quadrant, Section			
Field Comments			
	Entered ___ Validated ___	Entered ___ Validated ___	Entered ___ Validated ___

Field Team	Initial
Completed by	
QC by	

vs 021302

Sheet No.: CSS (W)- ________

CONTAMINANT SCREENING STUDY

FIELD SAMPLE DATA SHEET FOR WATER

Scenario No.: ______ Field Logbook No: ________ Page No: ______ Sampling Date: ______

Address: ______________________ Owner: ______________________

Land Use: Residential School Commercial Mining Roadway Other ( )

Sampling Team: PES CDM Other ______ Names: ______________________

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Location ID			
Sample Group			
Location Description			
Category (circle)	FS Trip Blank FD______	FS Trip Blank FD______	FS Trip Blank FD ______
Matrix Type (circle)	Surface Water Well Water Laboratory Water Rinsate Other ______	Surface Water Well Water Laboratory Water Sediment Other ______	Surface Water Well Water Laboratory Water Sediment Other ______
Field Comments			
	Entered ___ Validated ___	Entered ___ Validated ___	Entered ___ Validated ___

Field Team	Initial
Completed by	
QC by	

CDM-LIBBY-04
Completion of Information Field Forms

Completion of Property Information Field Form

Project: Libby Asbestos Remedial Investigation - Contaminant Screening Study (CSS)

Project No.: 3282-116

Document No.: CDM-LIBBY-04

Approved by: Jeff Montera 5/8/02
Project Manager Date

J. Montera for D. Schroeder 5/8/02
Technical Reviewer Date

Mary Goldade 5/7/02
EPA Approval Date

An information field form (IFF) is to be completed for each structure located on a property. Two IFFs will be used: (1) primary structure and property assessment information field form and (2) secondary structure information field form. The IFFs are completed from both interviews with the occupant/owner and visual inspection of the structures and surrounding properties and are used to facilitate the information-gathering process (interview and visual inspection) of properties during the contaminant screening study (CSS).

Definitions:

Primary structure – Refers to the main inhabitable structure on a property or the main commercial structure on a property.

Secondary structure – Refers to structures other than the primary structure located on a property (i.e., shed, barn, detached garage with an attic, etc.). Attached garages are considered part of the primary structure.

Occupant – Refers to the person currently living in a primary residential structure.

Owner – Refers to the person who owns a residential property (may or may not be the current occupant) or person who owns a commercial property.

Completion of Property Information Field Form

Primary Structure and Property Assessment Information Field Form

Each entry on the IFF should be completed following the guidance procedure, and any notes on each item should be written in the notes column to the right of each data item.

Header Information

BD#: Refers to the location identification (ID) number of the structure the IFF is being completed for. The field team obtains a list of available numbers from the sample coordinator.

Field Logbook No.: The number of the field logbook that is used to record information specific to the property being assessed on the IFF.

Page No.: The page numbers in the logbook that contain information specific to the property being assessed on the IFF.

Site Visit Date: Date of site visit, in the form MM/DD/YY.

Address: The address of the property being assessed on the IFF. Addresses are to be entered in the following format:

Street number – Direction – Street Name – Street Abbreviation

Where:
Street number = the number of the street address
Direction = the abbreviation of the street direction (N, S, E, or W), when applicable
Street name = correct spelling of the street name
Street abbreviation = when applicable

Road – Rd
Avenue – Ave
Street – St
Circle – Cr
Place – Pl
Boulevard – Blvd
Highway - Hwy

Examples: 510 N Mineral Ave
1616 Rainy Creek Rd
521 Pipe Creek Rd

Completion of Property Information Field Form

Structure Description: Description of the structure specific the IFF (i.e., house, trailer, garage, shed, barn)

Occupant: Name of current occupants of the primary structure. In the case of a commercial property, the occupant information would not be completed.

Occupant Phone number: Phone number of occupant of the primary structure.

Owner: Only needs to be completed if the owner of the structure or property is different than the current occupant (i.e., renter). Required for commercial properties.

Owner Phone number: Phone number of the owner of the property. For residential properties, only complete if the owner is different than the current occupant. Required for commercial properties.

Sampling Team: Full name and company of each member of the team assessing the property (i.e., members sampling and/or completing IFF).

Field Form Check Completed by (100% of forms): To be signed, after IFF is checked by the field team member not completing the IFF.

Screening Field check Completed by (2% of forms): To be signed, after IFF is checked by the CSS task leader.

House Attributes

Property Description: Description of the property specific to the IFF being completed.

Surrounding Land Use: Description of the land use groups surrounding the property specific to the IFF being completed. Indicate all that apply.

Year of Construction: Year structure was constructed. If occupant and/or owner do not know what year the structure was complete, choose unknown.

Square Footage: Calculated from the field diagram or estimated from occupant/owner interview.

Construction Material: Material structure is constructed from. If other than wood, masonry, or stone, choose other and provide a description.

Completion of Property Information Field Form

Number of Floors Above Ground: Number of floors above ground specific to the structure that is assessed on the IFF. If other than 1, 2, or 3, provide number of floors in blank. The number of floors above ground should include the attic only if it is used as a living space.

Number of Rooms Per Floor Above Ground: Number of rooms per floor that is above ground. Enter number of rooms per floor next to the floor number. If more than three floors are present, provide the information on the blank.

Basement: If a basement is present, choose yes. If a basement is not present, choose no. Basement refers to a room below ground level that a person can enter and stand upright (i.e., a crawl space is not a basement).

Heating Source: Method by which heat is produced in the structure. If a method other than wood/coal, electric, or propane/gas is used as a heating source, choose other and provide a description.

Heat Distribution: Method by which heat is distributed throughout the structure. Occupant and/or owner should be able to provide this information.

Occupant Information

Number of Adults/Employees: For residences, provide the number of adults that live at the residence; for a commercial property, provide the number of employees that work in the structure.

Number of Children: For residences, provide the number of children living there; for a commercial property, indicate the number of children as zero.

Years at Location: Number of years current occupant or business has occupied the structure.

Was the residence/building remodeled? Provide yes or no as an answer. If yes, provide years since remodeling and location of remodeling. If occupant/owner is unsure, provide a note in the provided space.

Has resident/business purchased any Libby vermiculite materials from W.R. Grace in the past? Based on occupant/owner interview. Provide yes or no as an answer. If occupant/owner is unsure, provide a note in the provided space.

Completion of Property Information Field Form

Has the property at this location been used for a for-profit enterprise of distributing, treating, storing, or disposing of Libby vermiculite? Based on occupant/owner interview. Provide yes or no as an answer. If occupant/owner is unsure, provide a note in the provided space.

Has any present or former occupant worked at the W.R. Grace mine and/or any former processing plant? Based on occupant/owner interview. Provide yes or no as an answer. If occupant/owner is unsure, provide a note in the provided space.

Has any present or former occupant been diagnosed with an asbestos-related disease? Based on occupant/owner interview. Provide yes or no as an answer. If occupant/owner is unsure, provide a note in the provided space.

Are there any known areas of exposed vermiculite?: Base yes or no answer on occupant/owner interview and visual inspection of home. If yes, provide location of exposed vermiculite.

Indoor Assessment

Vermiculite Insulation Past or Present: Visual inspection of attic is required to answer item. If owner/occupant indicates past presence of vermiculite insulation, note in space provided and year of removal if available. Past or present presence in walls, basements, and crawl spaces can be answered from the occupant/owner interview, but this must be noted in the area provided.

Evidence of Physical Damage? Based on visual inspection of interior

Evidence of Water Damage? Based on visual inspection of interior

Evidence of vermiculite used in building materials? Based on occupant interview and/or visual inspection. If owner is unsure or visual inspection is not comprehensive, provide this information in the notes area.

Completion of Property Information Field Form

Outdoor Assessment

Libby Amphibole Sources Present: Based on visual inspection of the property. If vermiculite piles, tremolite rocks, or other primary sources are observed, provide yes as the answer. If primary sources appear absent but vermiculite is observed in garden soils or other disturbed areas, provide yes as the answer with notes in the area provided.

Proximity to Other Properties with Potential Sources of Libby Amphiboles: Based on observations of nearby properties. If near properties are known to contain potential sources of Libby amphiboles, it should be noted in this data item.

Type and Frequency of Activity Near Vermiculite Material – Indoor: Based on occupant/owner interview. Frequency of contact, duration of contact, and extent of contact are required. If no indoor vermiculite present, provide this information in the notes area.

Type and Frequency of Activity Near Vermiculite Material – Outdoor: Based on occupant/owner interview. Frequency of contact, duration of contact, and extent of contact are required. If no outdoor vermiculite present, provide this information in the notes area.

CSS Assessment

Occupant Information:

- Is there any knowledge of former miners, close relative of miners, or any highly exposed persons living or visiting the property? *Based on verbal interview.*
- Is the resident diagnosed with an asbestos related disease? *Based on verbal interview.*

Indoor Information:

- Does the interior have Libby vermiculite attic insulation? *Based on visual inspection.*
- Did the interior ever have Libby vermiculite attic insulation? *Based on verbal interview.*
- Are there vermiculite additives in any of the building materials? *Based on visual inspections and verbal interview.*

Outdoor Information:

- Is there any evidence of primary source material near the property? *Based on visual inspection.*

Completion of Property Information Field Form

- Could this have been tracked indoors or otherwise spread outdoors on the property? *Based on visual inspections and verbal interview.*

Additional Information

Any information concerning the presence of sources that are identified in the occupant/owner interview.

Field Diagram of Property

To include location of all structures, observed sources, and location of all disturbed areas.

Field Diagram of Primary Structure

To be completed for homes with vermiculite insulation past or present. Complete one sheet per floor and provide scale drawing of rooms.

Secondary Structure Information Field Form

All data items are discussed above. Not all items on the primary structure form are required on the secondary structure form.

Heating Source and Heating Distribution may not be applicable to a secondary structure.

CDM-LIBBY-05

Site-Specific Standard Operating Procedure for Soil Sample Collection

Site-Specific Standard Operating Procedure for Soil Sample Collection

SOP No: CDM-LIBBY-05

Project: Libby Asbestos Remedial Investigation – Contaminant Screening Study (CSS)

Project Number: 3282-116

Prepared by: Thomas E. Cook, Environmental Scientist — 4/3/02 (Date)

Approved by: [signature] Project Manager — 5/8/02 (Date)

[signature] Technical Reviewer — 5/8/02 (Date)

[signature] QA Reviewer — 5/8/02 (Date)

[signature] EPA Approval — 5/7/02 (Date)

Section 1
Purpose

The purpose of this standard operating procedure (SOP) is to provide a standardized method for surface soil sampling to be used by employees of EPA Region VIII contractors/subcontractors supporting EPA Region VIII Contaminant Screening Study (CSS) for the Libby Asbestos Project in Libby, Montana. This SOP describes the equipment and operations used for sampling surface soils in residential areas, which will be submitted for the analysis of Libby amphiboles. The EPA Region VIII regional project manager, regional toxicologist, or on-scene coordinator must approve site-specific deviations from the procedures outlined in this document prior to initiation of the sampling activity. This SOP provides the protocols for composite surface-soil sampling.

Section 2
Responsibilities

Successful execution of the sampling and analysis plan (SAP) requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role.

The CSS task leader is responsible for overseeing the CSS residential surface soil sampling activities. The CSS task leader is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and the SAP. It is the responsibility of the CSS task leader to communicate with the field personnel specific collection objectives and anticipate situations that require any deviation from the SAP. It is also the responsibility of the CSS task leader to communicate the need for any deviations from the SAP with the appropriate EPA Region VIII personnel (remedial project manager or on-scene coordinator).

Field personnel performing soil sampling are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples at residences. The field personnel should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of the sample point, within the boundaries outlined by the CSS task leader.

Section 3
Equipment

- Sample container - The sample container will consist of quart-sized zip-top plastic bags (2 per sample).
- Trowel - For collecting surface soil samples.
- Bulb planter - For collecting surface soil samples.
- Shovel - For collecting surface soil samples.
- Stainless Steel Mixing bowl - Used to mix and homogenize composite soil samples after collection.
- Gloves - For personal protection and to prevent cross-contamination of samples. May be plastic or latex. Disposable, powderless.
- Field clothing and personal protective equipment (PPE) - As specified in the health and safety plan (HASP).
- Field sprayers - For decontaminating nondisposable sampling equipment between samples will be used.
- Silica sand - For field equipment blank quality control (QC) samples.
- Wipes - Disposable, paper. Used to clean and decontaminate sampling equipment.
- Field logbook -Used to record progress of sampling effort and record any problems and field observations.
- Information Field Forms (IFF) - Used to record information such as property detail, location of amphibole contamination, and estimated quantities.
- Field Sample Data Sheet (FSDS) - Used to record soil sample information.

- Permanent marking pen - Used to label sample containers.
- Index ID stickers - Used to label sample containers.
- Plastic buckets - Used to wash nondisposable field equipment between samples.
- Trash bag - Used to dispose gloves and wipes.
- Cooler - Used to store samples while in the field.
- Chain of Custody Record - For ensuring custody of samples until shipping.
- Custody Seals - For ensuring custody of samples during shipping.

Section 4
Sampling Pattern

Each property will be segregated into land use areas for sampling purposes. Use areas may include but not be limited to:

- Yard (grassy area)
- Landscaped area
- Garden
- Fill area

Properties with grassy areas greater than ½ acre in size will be sectioned off into separate zones for increased accuracy in characterization. Sectioning properties into additional zones will be at the discretion of the CDM field team leader but consistent among the teams. This segregation will be accomplished so that a five-point composite sample will characterize the section. A five-point composite sample will be collected for land areas less than or equal to 1/8 of an acre.

Up to five composite soil samples will be collected at each property. Composite sampling requires soil collection from multiple (sub-sample) points. Composite samples will be collected from similar land use areas (i.e., yard, garden, stockpiled soil, etc.). Additional composite or grab samples may be collected dependent upon site conditions (i.e., multiple land use areas, zones, etc.). Conversely, not all land areas previously mentioned will be applicable at every property and fewer (not less than two) will be collected. An example diagram illustrating various land use areas for sampling purposes is included as Figure C-1.

For non-disturbed areas (i.e., yard), composite samples will be collected from 0 to 1 inch (in.). For disturbed areas (i.e., garden, fill area, landscaped areas, etc.), composite samples will be collected from 0 to 6 in. All composite soils samples will have five subsamples (i.e., five-point composite sample) of approximately equal size.

Any land use areas where vermiculite product is visible will not be sampled. Instead, detailed information (i.e., approximate amounts, location, estimated time of introduction) will be recorded in the field logbook and on the IFF.

Section 5
Sample Collection

Don the appropriate PPE as specified in the HASP. A new pair of plastic gloves are to be worn for each sample collected. Segregate land use areas on the property as described in Section 4. Visually inspect each land use area for visual vermiculite product. Use the trowel to check beneath the surface soil layer, but do not advance more than 6 in. If visible vermiculite is observed, record information in the appropriate field forms and do not collect a sample from that land use area. If visible vermiculite is not observed, proceed with sample collection.

Within each land use area, select five subsample locations equidistant from each other. These five subsample locations will comprise the five-point composite sample for that land use area. All composite subsamples will originate from the same land use area. For example, do not mix subsamples from garden areas with subsamples from grassy areas.

Clean the subsample locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel, excavate a hole in the soil approximately 2 in. in diameter and 1 in. deep (6 in. for disturbed areas) while placing the excavated material directly inside the mixing bowl. The sides of the excavated hole should be close to vertical to avoid sampling that is biased in favor of the upper layer of soil. Repeat this step for each subsequent subsample until the appropriate number of composite subsamples has been collected.

Homogenize the sample using the sampling trowel. Once the sample is homogenized, fill the zip-top plastic bag full (approximately 2000 grams). Affix the sample index identification (ID) sticker to the inside of the bag and write the index ID number on the outside of the bag. Double bag the sample and repeat the labeling process for the outer bag. Decontaminate equipment between composite samples as described in Section 8.

Repeat steps outlined above until all samples from a property have been collected.

Section 6
Site Cleanup

Specific instruction regarding site cleanup of investigation-derived waste (IDW) is included in CDM SOP 2-2, Guide to Handling Investigation-Derived Waste, with modification. In general, replace soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas such as playgrounds are sampled, refilling the soil plug is not necessary.

Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be disposed of on the ground as specified in the SAP.

Section 7
Record Keeping and Quality Control

A field logbook should be maintained by each individual or team that is collecting samples as described in the SAP. The SAP will detail specific conditions (SOP 4-1), which require attention, but at a minimum the following information should be collected:

- Date
- Time
- Team members
- Weather conditions
- PPE used
- Locations of any samples and subsamples that could not be acquired
- Descriptions of any deviations to the SAP and the reason for the deviation

Complete the IFF and FSDS for each property/sample.

Quality control samples will include:

- Field duplicates
- Aqueous rinsate samples
- Solid rinsate samples

Detailed information on QC sample collection and frequency is included in the SAP.

Section 8
Decontamination

All sampling equipment must be decontaminated prior to reuse. Specific instructions on sample equipment decontamination are included in CDM SOP 4-5, Field Equipment Decontamination at Nonradioactive Sites, with modification. In general, the procedure to decontaminate all equipment is outlined below:

- Remove visible soil
- Rinse equipment with locally available deionized water
- Rinse equipment with ASTM Type II deionized water (for rinsate samples only)

Washing should be performed by sequential immersion of the equipment in buckets filled with deionized water and alconox detergent. If necessary, a brush should be used to remove soil material on the trowel shovel. Equipment should be set on clean toweling to dry. Equipment should be visibly dry before being used again.

Spent wipes, gloves, and PPE must be disposed or stored properly as specified in the SAP.

Section 9
Glossary

Sampling and Analysis Plan (SAP) - The written document that spells out the detailed site-specific procedures to be followed by the project leader and the field personnel.

Sample Point - The actual location at which the sample is taken. The dimension of a sample point is 2 in. across by 1 in. deep (6 in. for disturbed areas).

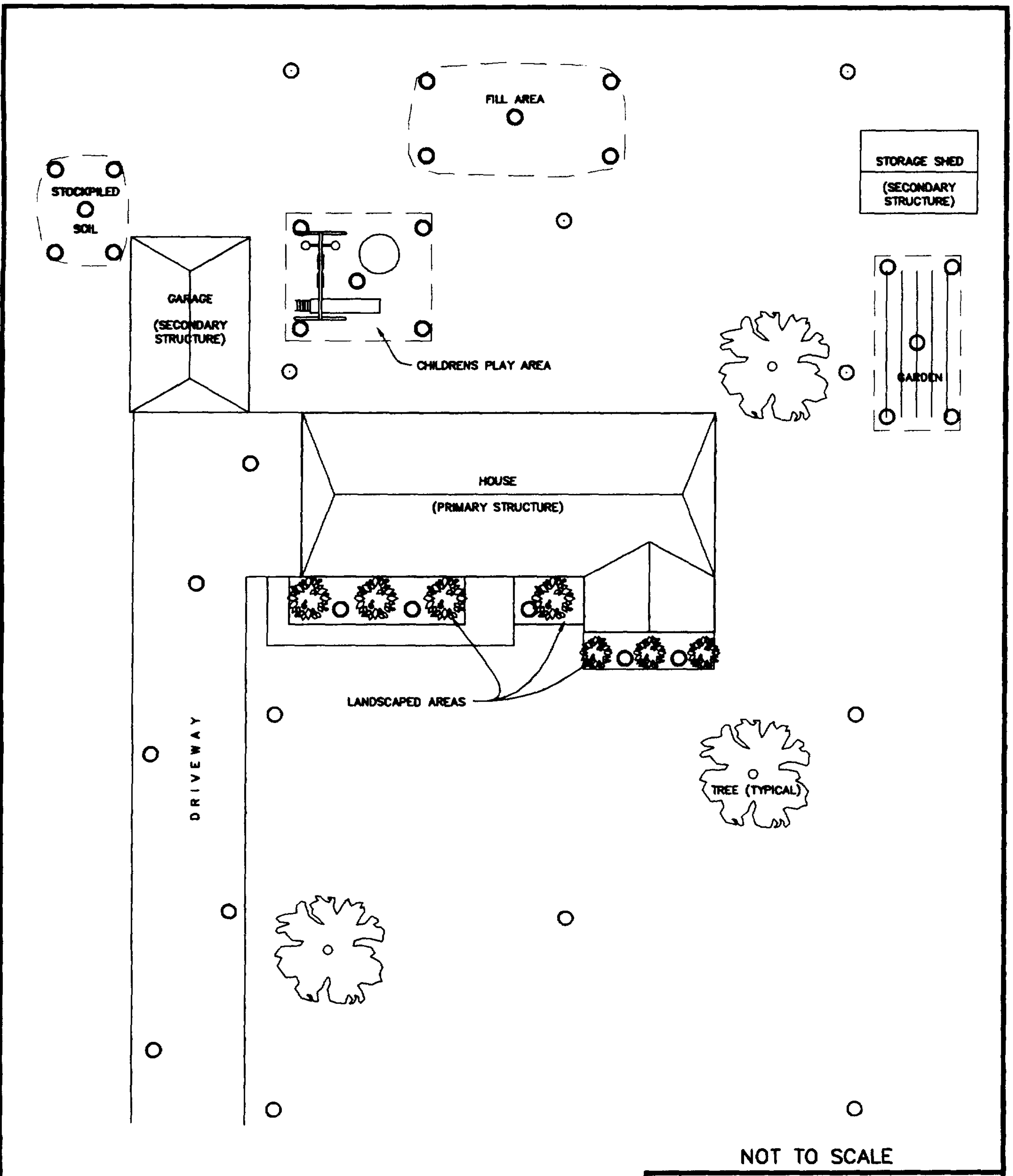
Composite Sampling - A sample program in which multiple sample points are compiled together and submitted for analysis as a single sample.

Land Use Area - A section of property segregated by how the property owner uses the section. For example, garden landscaped areas are individual land use areas. Grassy areas (i.e., lawn) are also considered to be a separate land use area.

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.



LEGEND

- DRIVEWAY SAMPLE (0–6")
- FRONT YARD SAMPLE (0–1")
- BACK YARD SAMPLE (0–1")
- LANDSCAPED AREA SAMPLE (0–6")
- GARDEN SAMPLE (0–6")
- OPPORTUNITY SAMPLE (0–6")

Figure C-1

Example Sampling Locations and Property Site Layout

Libby Asbestos Project
Libby, Montana

CDM

T:\CADD\LIBBYSITE.dwg 04/29/02

EPA SOP ISSI-LIBBY-01
Soil Sample Preparation

Date: May 7, 2002 (Rev. # 3) SOP No. ISSI-LIBBY-01

Title: SOIL SAMPLE PREPARATION

APPROVALS:

Author William Brattin Syracuse Research Corporation[a]. Date: May 7, 2002

SYNOPSIS: A standardized method for homogenization of surface soil samples is described. Protocols for sample preparation and handling are provided.

Received by QA Unit:

REVIEWS:

TEAM MEMBER	SIGNATURE/TITLE	DATE
EPA Region 8	Wacey Goldade	5/7/2002
Syracuse Research Corp.	W J Brattin	5/7/02

Revision Date	Reason for Revision
1/7/99	Incorporation of sieving to the sample preparation.
7/12/00	Revision in sieve size, other minor edits.
5/7/02	Incorporate minor edits

(a) This SOP was originally prepared by ISSI Consulting Group. ISSI is no longer in existence, and finalization of the SOP was performed by Syracuse Research Corporation (SRC).

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for homogenizing surface soil samples. This procedure will be used by employees of USEPA Region 8 and by contractors/subcontractors supporting USEPA Region 8 projects and tasks. This SOP describes the equipment and operations used for homogenizing surface soil samples in a manner that will produce data that can be used to support risk evaluations. Site-specific deviations from the procedures outlined in this document must be approved by the USEPA Region 8 Remedial Project Manager, or Regional Toxicologist prior to initiation of the sampling activity.

2.0 RESPONSIBILITIES

The Field Project Leader (FPL) may be an USEPA employee or contractor who is responsible for overseeing the surface soil sampling activities. The FPL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and the Project Plan. It is the responsibility of the FPL to communicate with the Field Personnel regarding specific collection objectives and anticipated situations that require any deviation from the Project Plan. It is also the responsibility of the FPL to communicate the need for any deviations from the Project Plan with the appropriate USEPA Region 8 personnel (Remedial Project Manager, or Regional Toxicologist).

Field personnel performing surface soil sampling are responsible for adhering to the applicable tasks outlined in this procedure while homogenizing surface soil samples.

3.0 EQUIPMENT

- <u>General purpose laboratory oven</u> - must be capable of maintaining a constant temperature of approximately 103-105°C.

- <u>Sample drying trays</u> - capable of holding an even layer of the complete sample volume of each sample. To minimize the decontamination effort, disposable drying trays are recommended.

- <u>Analytical balance</u> - accurate to 0.1 g, range of 0.1 g to 1000 g

- <u>Riffle splitter</u> - with 3/4 to 1 inch chutes to split samples

- <u>Stainless steel or teflon scoop or spoon</u> - for transferring samples

- <u>1-cm (3/8-inch) mesh stainless steel sieve and catch pan</u> - for coarse sieving samples

- Collection containers - plastic ziplock bags.

- Gloves - for personal protection and to prevent cross-contamination of samples. May be plastic or latex. Disposable, powderless.

- Field clothing and Personal Protective Equipment - as specified in the Health and Safety Plan.

- Field notebook -used to record progress, any problems or observations.

- Permanent marking pen - used to label sample containers.

- Three-ring binder book - binders will contain Soil Preparation Sheets, Field Split Sample Log sheets, and sample labels.

- Trash Bag - used to dispose of gloves and wipes.

4.0 METHOD SUMMARY

Soil samples will be dried in a standard laboratory oven, then homogenized and split for subsequent analysis.

5.0 BULK SOIL DRYING

Set the oven temperature to 103-105 °C (not to exceed 115 °C). Establish the drying time by weighing a representative sample before drying, at estimated completion, and following an additional 15 minute drying time to confirm stable weight. Verify that the sample is completely dry using the "squeeze test", squeezing a portion of the sample between a freshly gloved thumb and forefinger. Sample dryness is indicated by a lack of cohesiveness in the soil.

Prior to drying each sample, record the weight on the Sample Preparation Logbook Sheet. Spread the sample on the drying tray in an even layer to promote even drying. Check the oven temperature to verify that proper temperature has been reached. Mark each tray with the sample ID number. Cover each sample with cheesecloth to minimize the potential for cross-sample contamination. Place the drying trays containing the samples in the oven. Leave the samples in the oven until completely dry. Verify that each sample is dry by testing cohesiveness using a freshly gloved thumb and forefinger. Record the weight after drying on the Sample Preparation Logbook Sheet. Document the sample drying time for each sample on the Soil Preparation Logbook Sheet (Attachment 1).

When samples are dry, remove from the oven area and place in the ventilation area. **Before placing samples in the ventilation area, verify that the hood is turned on.** A new pair of gloves must be worn for each sample.

The sample should be coarse sieved using a 1-cm (3/8-inch) screen. Pour the material which passed through the sieve into a new sample bag, and mark the outside of the bag with the sample ID. Gently knead contents of the bag to break up any remaining soil clumps. Completely seal the bag, then mix by turning the bag end-over-end slowly, for a minimum of ten times.

6.0 SAMPLE SPLITTING

Following the procedures outlined in Section 5.0, the soil sample should be well-homogenized. With the hood turned on, open the sample bag and use a clean and dry riffle splitter to split each sample.

The following method for splitting a soil sample was adapted from EPA 540-R-97-028 (USEPA, 1997). The sample is split by placing soil onto a splitter tray. Shake the tray to evenly distribute the sample. Place the long lip of the tray against the long lip of the splitter hopper and slowly rotate the tray so that the sample slowly empties into the splitter and slides down the near wall of the hopper to the chutes, collecting the sample in two receiving trays. Tap the sample tray vigorously several times to free any remaining material. Tap the splitter to facilitate the flow of all material through the chutes into the receiving trays. The corners and nooks of the splitter may be cleaned with a coarse nylon brush.

Pour the material from one of the receiving trays into a clean bucket and tap the tray vigorously to assure complete transfer. This portion is designated for archive. The original sample tray (which is now empty), and the emptied receiving tray should be placed under the splitter as the new receiving trays.

Repeat the process of dispersing the remaining sample material (containing half the mass of the original sample) by shaking the sample tray so that it is uniformly distributed. Repeat the procedure described above for splitting the sample. At the end of the second split, carefully transfer the material from each of the receiving trays into a clean, pre-weighed sample bag to be weighed and packaged for shipment to the laboratory and to W.R. Grace. Record each split sample ID, and the original sample ID on the Field Split Sample Log Sheet (Attachment 1).

7.0 FIELD DOCUMENTATION

Each sample ID must be recorded on the data sheets. Original sample ID numbers are recorded on the Soil Preparation Sheets, and the Field Split Sample Log sheets. When the original sample is split, the original sample ID number, and each new sample, must be recorded.

In addition, a field notebook should be maintained by each individual or team that is preparing samples. For each day that samples are processed, the following information should be collected:

- date
- time
- personnel
- weather conditions
- analytical balance calibration
- drying oven temperature
- descriptions of any deviations to the Project Plan and the reason for the deviation

Field personnel will prepare the proper type and quantity of quality control samples as prescribed in the Project Plan.

8.0 DECONTAMINATION

All non-dedicated equipment used during sample preparation must be decontaminated prior to use. It is recommended that disposable oven trays be used to minimize the decontamination effort. Stainless steel or teflon scoops or spoons, splitters, sieves and drying trays that will be re-used, must be decontaminated with de-ionized (DI) water and disposable wipes or towels. DI water is poured over the equipment, then wiped, then rinsed again with DI water. If soil particles are visible on any of the equipment, repeat this procedure until the equipment is clean. All equipment must be dry before it is re-used.

9.0 GLOSSARY

Project Plan - The written document that spells out the detailed site-specific procedures to be followed by the Project Leader and the Field Personnel.

10.0 REFERENCES

American Society for Testing and Materials. 1998. Standard Practice for Reducing Samples of Aggregate to Testing Size, ASTM Designation: C 702 - 98, 4 p.

USEPA. 1997. Superfund Method for the Determination of Releasable Asbestos in Soils and Bulk Materials. EPA 540-R-97-028.

ATTACHMENT 1

Sample Preparation Logbook Sheet

Prep Batch Number	Sample ID	Sample Drying							Sieving (c)				Homogenization		Sample Splitting			Notes
		Date/Time Drying Begun (a)	Date/Time Drying Completed (a)	Oven Temp (C)	Sample Mass (grams) (b)				Sample Mass (grams)									
					Before	After 1	After 2	After 3	Sample (d)	Sieved Fraction	Date	Tech. Initials	Date	Tech. Initials	N	Date	Tech. Initials	

(a) Enter date in the following format: mm/dd/yy; enter time as 24-hour time (e.g., 1340)

(b) At least 2 mass measurements will be recorded. The sample is completely dry if the mass measurement is stable.

(c) Use a wire-mesh sieve with 1 cm (3/8") openings.

(d) Sample mass prior to sieving.

Field Split Sample Logsheet

Date	Split Sample ID	Original Sample ID	Prepared By	Notes

 Approved By:______________ Page No.:______

Site-Specific Guidance Document
CSS Primary Structure Information Field Form

BD#__________

LIBBY ASBESTOS PROJECT
Contaminant Screening Study
Primary Structure and Property Assessment Information Field Form

Field Logbook No.:____________ Page No.:________ Site Visit Date: ________________

Address:______________________________ Structure Description:________________

Occupant:____________________________________ Phone Number:____________

Owner (if different than occupant):________________________ Phone Number:____________

Sampling Team:____

Field Form Check Completed by (100% of forms):______________________________

Screening Field Check Completed by (2% of forms):______________________________

Data Item	Value	Notes
HOUSE ATTRIBUTES		
Property Description	Residential Industrial Commercial	
Surrounding Land Use	Residential Industrial Commercial School Mining Other:__________	
Year of Construction	________ Unknown	
Square Footage		
Construction Material	Wood frame Masonry/Stone Other:__________	
Number of Floors Above Ground	1 2 3 Other:________	
Number of Rooms Per Floor Above Ground	1:____ 2:____ 3:____ Other:__________	
Basement	Yes No	
Heating Source	Wood/Coal Electric Propane/Gas Other:__________	
Heat Distribution	Forced air Radiant Other:__________	

CSS INFORMATION FIELD FORM (continued)

Address:______________________________ BD#__________

Data Item	Value	Notes
OCCUPANT INFORMATION		
Number of Adults/Employees	1 2 3 4 5-15 16-20 21-30 >30	
Number of Children	0 1 2 3 4 Other:__________	
Years at Location	<1 1-5 5-10 10-15 >15	
Was the residence/building remodeled?	Yes No If yes, When (years): <2 2-5 >5 Where: Attic Living Areas Garage Basement Other:__________	
Has resident/business purchased any Libby vermiculite materials from W.R. Grace in the past?	Yes No	
Has the property at this location been used for a for-profit enterprise of distributing, treating, storing, or disposing of Libby vermiculite?	Yes No	
Has any present or former occupant worked at the W.R. Grace mine and/or any former processing plant?	Yes No	
Has any present or former occupant been diagnosed with an asbestos related disease?	Yes No	
Are there any known areas of exposed vermiculite?	Yes No If yes, Where: Ceiling Walls Floors Attic Other:__________	

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

Data Item	Value	Notes
INDOOR ASSESSMENT		
Vermiculite Insulation Past or Present	Attic: Yes No NA Walls: Yes No NA Basement: Yes No NA Crawl Space: Yes No NA Other:________________	Visual confirmation of current presence or absence required for attic.
Evidence of Physical Damage?	Yes No	
Evidence of Water Damage?	Yes No	
Evidence of vermiculite used in building materials?	Yes No	
OUTDOOR ASSESSMENT		
Libby Amphibole Sources Present	Garden: Yes No NA Yard: Yes No NA Stockpiles: Yes No NA Other:________________	
Proximity to Other Properties with Potential Sources of Libby Amphiboles	Next door Within same block Other:________________	

CSS INFORMATION FIELD FORM (continued)

Address:_______________________________________ BD#__________

Data Item	Value		Notes
EXPOSURE ASSESSMENT			
Type and Frequency of Activity Near Vermiculite Material - Indoor	Frequency:	Once a day Once a week Once a month Once a year	
	Duration of Contact:	<1 hour 1-2 hours 2-4 hours >4 hours	
	Extent of Contact:	Heavy Moderate Light	
Type and Frequency of Activity Near Vermiculite Material - Outdoor	Frequency:	Once a day Once a week Once a month Once a year	
	Duration of Contact:	<1 hour 1-2 hours 2-4 hours >4 hours	
	Extent of Contact:	Heavy Moderate Light	

CSS INFORMATION FIELD FORM (continued)

Address:______________________________ BD#__________

Data Item	Value	Notes
CONTAMINANT SCREENING STUDY ASSESSMENT		
Occupant Information		
Is there any knowledge of former miners, close relative of miners, or any highly exposed persons living or visiting the property?	Yes No Unknown	
Is the resident diagnosed with an asbestos related disease?	Yes No Unknown	
Indoor Information		
Does the interior have Zonolite attic insulation?	Yes No Unknown	
Did the interior ever have Zonolite attic insulation?	Yes No Unknown	
Are there vermiculite additives in any of the building materials?	Yes No Unknown	
Outdoor Information		
Is there any evidence of primary source materials near the property?	Yes No Unknown	
Could this have been tracked indoors or otherwise spread outdoors on the property?	Yes No Unknown	

ADDITIONAL INFORMATION

____

____

____

____

____

____

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

FIELD DIAGRAM OF PROPERTY

Identify important features (i.e. drainage, trees, gardens, suspected Libby amphibole source areas, etc).

NOT TO SCALE

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

FIELD DIAGRAM OF PRIMARY STRUCTURE

Floor of House (circle): First Second Third Basement

Include approximate dimensions of rooms and floor covering type. Use more than one diagram if needed.

Scale: 1/10" = 1 foot

Site-Specific Guidance Document
CSS Secondary Structure Information Field Form

LIBBY ASBESTOS PROJECT
Contaminant Screening Study
Secondary Structure Information Field Form

Field Logbook No.:____________ Page No.:________ Site Visit Date: ________________

Address:__________________________________ Structure Description:________________

Occupant:____ Phone Number:____________

Owner (if different than occupant):____________________________ Phone Number:____________

Sampling Team:____

Field Form Check Completed by (100% of forms):__________________________________

Screening Field Check Completed by (2% of forms):________________________________

Data Item	Value	Notes
STRUCTURE ATTRIBUTES		
Property Description	Residential Industrial Commercial	
Surrounding Land Use	Residential Industrial Commercial School Mining Other:____________	
Year of Construction	________ Unknown	
Square Footage		
Construction Material	Wood frame Masonry/Stone Other:____________	
Number of Floors Above Ground	1 2 3 Other:________	
Number of Rooms Per Floor Above Ground	1:____ 2:____ 3:____ Other:____________	
Basement	Yes No	
Heating Source	Wood/Coal Electric Propane/Gas NA Other:__________	
Heat Distribution	Forced air Radiant NA Other:__________	
Was the building remodeled?	Yes No	

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

Data Item	Value	Notes
Are there any known areas of exposed vermiculite?	Yes No	
	If yes, Where: Ceiling Walls Floors Attic Other:__________	
INDOOR ASSESSMENT		
Vermiculite Insulation Past or Present	Attic: Yes No NA Walls: Yes No NA Basement: Yes No NA Crawl Space: Yes No NA Other:____________________	Visual confirmation of current presence or absence required for attic.
Evidence of Physical Damage?	Yes No	
Evidence of Water Damage?	Yes No	
Evidence of vermiculite used in building materials?	Yes No	
EXPOSURE ASSESSMENT		
Type and Frequency of Activity Near Vermiculite Material	Frequency: Once a day Once a week Once a month Once a year	
	Duration of Contact: <1 hour 1-2 hours 2-4 hours >4 hours	
	Extent of Contact: Heavy Moderate Light	

CSS INFORMATION FIELD FORM (continued)

Address:______________________________ BD#__________

Data Item	Value	Notes
CONTAMINANT SCREENING SURVEY ASSESSMENT		
	Occupant Information	
Is there any knowledge of former miners, close relative of miners, or any highly exposed persons living or visiting the property?	Yes No Unknown NA	
Is the resident diagnosed with an asbestos related disease?	Yes No Unknown NA	
	Indoor Information	
Does the interior have Zonolite attic insulation?	Yes No Unknown NA	
Did the interior ever have Zonolite attic insulation?	Yes No Unknown NA	
Are there vermiculite additives in any of the building materials?	Yes No Unknown NA	
	Outdoor Information	
Is there any evidence of primary source materials near the property?	Yes No Unknown NA	
Could this have been tracked indoors or otherwise spread outdoors on the property?	Yes No Unknown NA	

ADDITIONAL INFORMATION

____

____

____

____

____

____

CSS INFORMATION FIELD FORM (continued)

Address:______________________________________ BD#__________

FIELD DIAGRAM OF SECONDARY STRUCTURE

Floor of House (circle): First Second Third Basement

Include approximate dimensions of rooms and floor covering type. Use more than one diagram if needed.

Scale: 1/10" = 1 foot

CSS INFORMATION FIELD FORM (continued)

Address:____________________________________ BD#__________

Site-Specific Guidance Document
CSS Field Sample Data Sheet for Soil

Sheet No.: CSS (S) - __________

CONTAMINANT SCREENING STUDY

FIELD SAMPLE DATA SHEET FOR SOIL

Scenario No.: ______ Field Logbook No: __________ Page No: _____ Sampling Date: ______

Address: ______________________________ Owner: ____________________________

Land Use: (circle) Residential School Commercial Mining Roadway Other ( )

Sampling Team: (circle) CDM PES Other ______ Names: ______________________

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Location ID			
Sample Group			
Location Description (circle)	Back yard Front yard Side yard Other ____________	Back yard Front yard Side yard Other ____________	Back yard Front yard Side yard Other ____________
Category (circle)	FS FD_______	FS FD_______	FS FD _______
Matrix Type (Surface soil unless other wise noted)	Surface Soil Other ____________	Surface Soil Other ____________	Surface Soil Other ____________
Type (circle)	Grab Comp. # subsamples ____	Grab Comp. # subsamples ____	Grab Comp. # subsamples ____
Sample Time			
Top Depth (in.)			
Bottom Depth (in.)			
Grid, Quadrant, Section			
Field Comments			
	Entered ___ Validated ___	Entered ___ Validated ___	Entered ___ Validated ___

Field Team	Initial
Completed by	
QC by	

vs 021302

Site-Specific Guidance Document
CSS Field Sample Data Sheet for Water

Sheet No.: CSS (W)- __________

CONTAMINANT SCREENING STUDY

FIELD SAMPLE DATA SHEET FOR WATER

Scenario No.: _______ Field Logbook No: ___________ Page No: ______ Sampling Date: _______

Address: ________________________________ Owner: ______________________________

Land Use: Residential School Commercial Mining Roadway Other ( )

Sampling Team: PES CDM Other ________ Names: ___________________________

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Location ID			
Sample Group			
Location Description			
Category (circle)	FS Trip Blank FD_________	FS Trip Blank FD_________	FS Trip Blank FD _________
Matrix Type (circle)	Surface Water Well Water Laboratory Water Rinsate Other _________	Surface Water Well Water Laboratory Water Rinsate Other ___________	Surface Water Well Water Laboratory Water Rinsate Other _______________
Field Comments			
	Entered ___ Validated ___	Entered ___ Validated ___	Entered ___ Validated ___

Field Team	Initial
Completed by	
QC by	

vs 021302

Site-Specific Guidance Document
CSS Chain of Custody Record

Chain of Custody Record **Libby Asbestos Investigation** **No. 000000**

U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 300
Denver, CO 80202-2413

Send to: ____________________
____
____
via: ☐ hand delivery ☐ shipped

Project (circle 1): Phase I Phase II Removal Action CSS

Sample Placed in Cooler/Bag	Index ID	Sample Date	Sample Time	Sample Matrix (S=Soil; W=Water; D=Dust; A=Air; B=Bulk Insulation)	Sample Type (G=Grab; C=Composite)	Volume (L) or Area (cm^2)	Analysis Request*	Comments	Sample Received by Lab
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐
☐									☐

***Phase I**: Air: preparation method EPA/540/2-90/005a, analytical method PCM (by NIOSH 7400), TEM (by ISO 10312 and AHERA). Dust: preparation method ASTM D5755-95, analytical method ISO 10312. Solid PLM: preparation and analysis by ISSI-LIBBY-01/NIOSH 9002. Soil IR: preparation and analysis method ISSI-LIBBY-02. Soil TEM: preparation method EPA/540/R-97/028, analytical method ISSI-LIBBY-01/ISO 10312. **Phase II**: Personal Air, Stationary Air: PCM (by NIOSH 7400), TEM (by Modified ISO 10312 – Phase 2 QAPP, approved 2/01), or TEM (AHERA) method. Bulk Insulation and Soil: PLM. Dust Samples: TEM (by ISO 10312). **CSS**: Soil SEM: preparation by ISSI-LIBBY-01, analytical method Asbestos Analysis of Soil by Scanning Microscopy and Energy Dispersive X-Ray Spectroscopy, Revison 0, July 11, 2000; Soil IR: preparation by ISSI-LIBBY-01, analytical method ISSI-LIBBY-02; Water: preparation by EPA 600/4-84-034, analytical method ISO 10312.

Total Number of Samples _____ END OF SUBMITTAL

Additional Comments:

____

____

Relinquished by (Signature and Company)	Date/Time	Received by (Signature and Company)	Date/Time	Sample Condition upon Receipt
Relinquished by (Signature and Company)	**Date/Time**	**Received by (Signature and Company)**	**Date/Time**	**Sample Condition upon Receipt**
Relinquished by (Signature and Company)	**Date/Time**	**Received by (Signature and Company)**	**Date/Time**	**Sample Condition upon Receipt**

Appendix D

Record of Deviation/Record of Modification Form

Record of Deviation/ Request for Modification

to the

Libby Sampling and Quality Assurance Project Plan

Instructions to Requester: Fax to contacts at bottom of form for review and approval. File approved copy with Data Manager and fax copy to SRC.

Project QAPP (circle one): PE Study Part a (approved 6/00), b (approval pending), c (approval pending)
Phase I (approved 4/00) Phase II (approved 2/01)
Removal Action (approved 7/00) CSS (approval 5/02)

Scenario No. (circle one): 1 2 3 4 NA

Requester: ______________________ Title: ______________________
Company: ______________________ Date: ______________________

Description of Deviation:

____

____

Field Logbook and page number deviation is documented on: ______________________
Reason for Deviation:

____

____

Potential Implications of this Deviation:

____

____

Duration of Deviation (circle one):

Temporary Date(s): ______________________
Resident address(es): ______________________
____

Permanent (complete Proposed Modification Section)

Proposed Modification to SQAPP (attach additional sheets if necessary; state section and page numbers of SQAPP when applicable):

____

____

____

Technical Review: ______________________ Date: ______________
(Volpe Project Manager or designate)

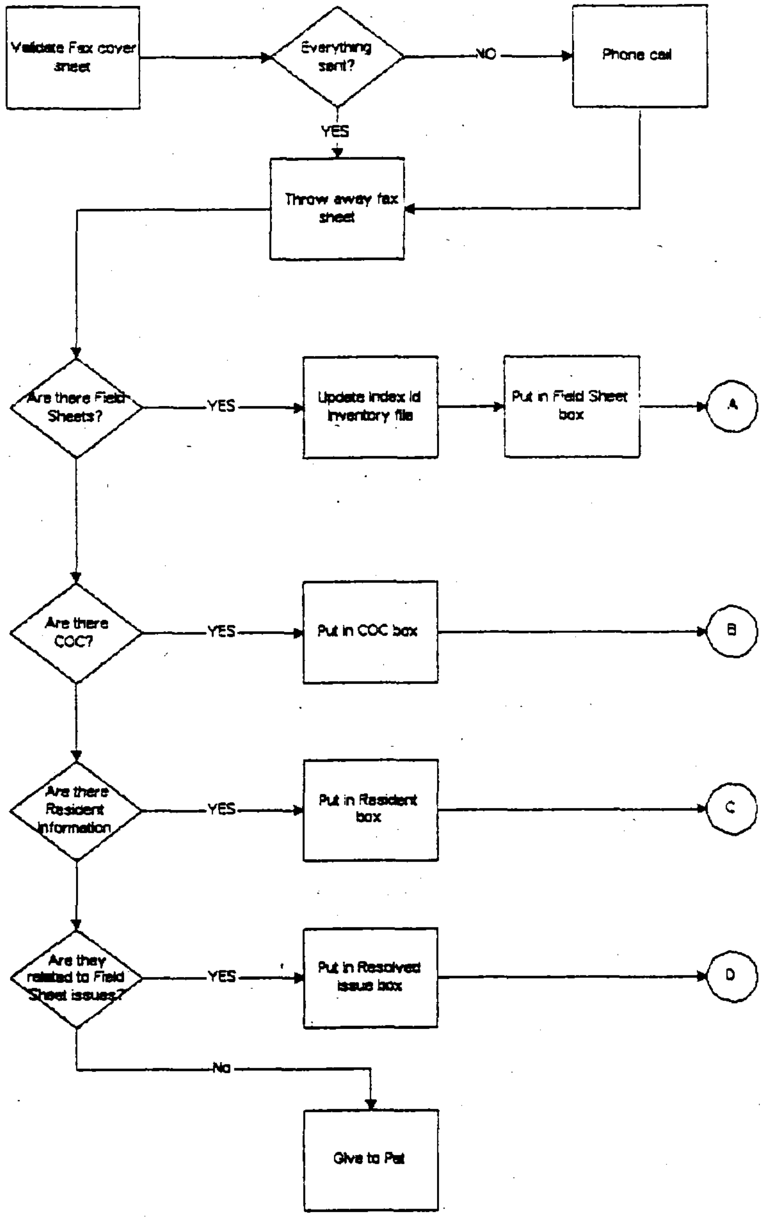
Quality Assurance Review and Approval: ______________________ Date: ______________
(Quality Assurance Coordinator or designate)

Approved By: ______________________ Title: ______________________ Date: ______________
(USEPA OSC or SSC)

Appendix E

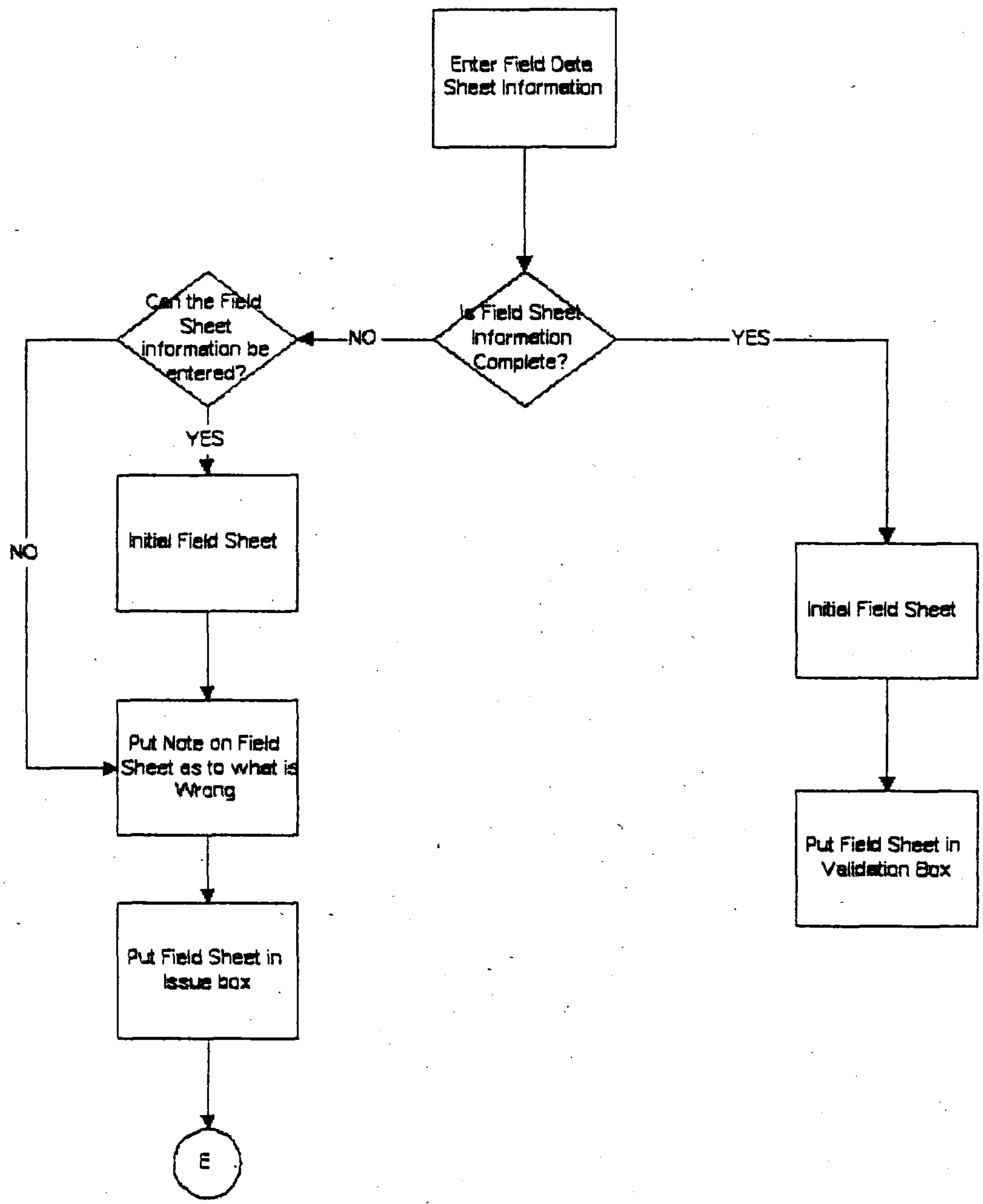
Volpe Center Paperwork Flow Process

Fax Process

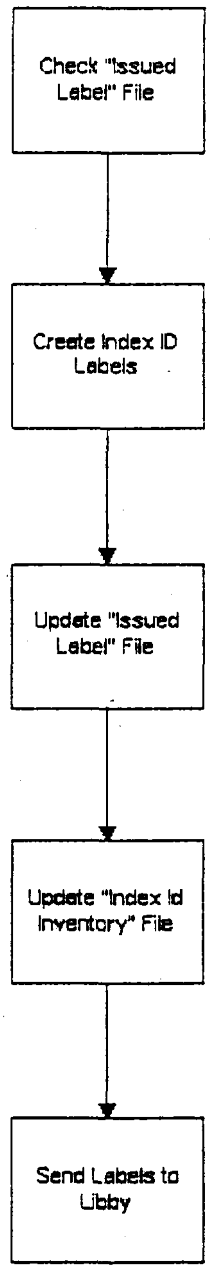


Validate Fax cover sheet
Everything sent?
NO
Phone call
YES
Throw away fax sheet
Are there Field Sheets?
YES
Update index id inventory file
Put in Field Sheet box
A
Are there COC?
YES
Put in COC box
B
Are there Resident information
YES
Put in Resident box
C
Are they related to Field Sheet issues?
YES
Put in Resolved issue box
D
No
Give to Pat

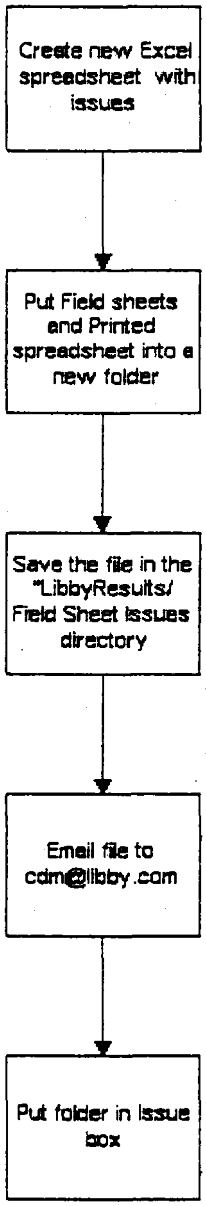
A - Field Sheet Process



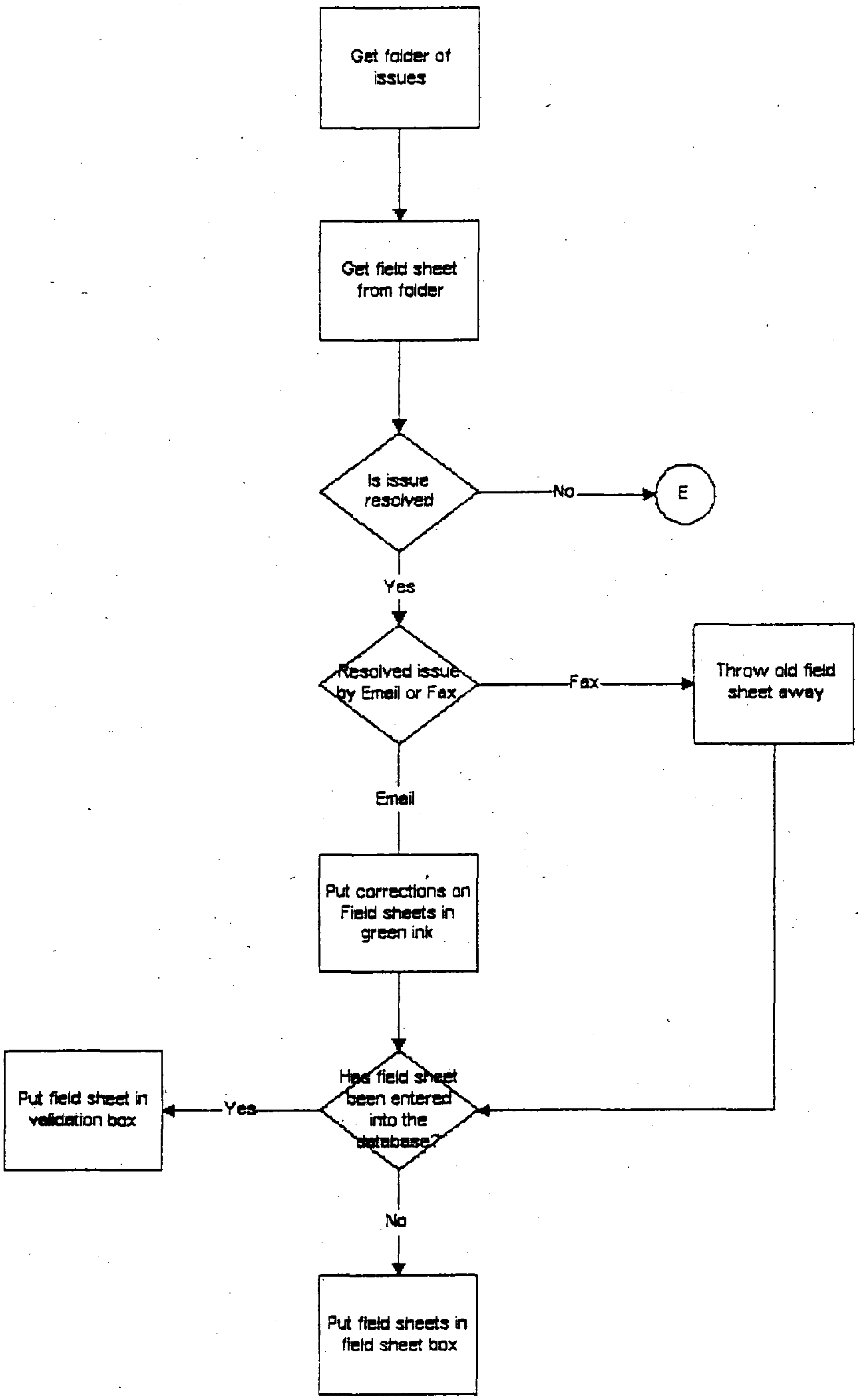
Index Label Process



E - Issue Process



D - Resolve Issue Process



Appendix F

Laboratory Training Outline

TRAINING OUTLINE
(Laboratory)

TRAINING ISSUES OF CONCERN

1. **Analytical Procedures**
   - Method Variances
   - QC Requirements
   - Visual References

2. **Mineralogy Recognition & Definition**
   - Libby-Type Amphibole
     - (Winchite, Richterite, Tremolite/Actinolite, Edenite/Ferroedenite, & Magnesio-arfvedsnoite)

3. **Reporting Requirements**
   - Data Entry & QA
   - Electronic & Hardcopy Submittal

4. **Operational Procedural Requirements**
   - Sample Logging
   - What to include in hardcopy laboratory reports
     - spectra, count sheets, QC sheets, etc.
   - Notification of any WR Grace conflicts of interests (as they occur)
   - Sample Archiving

TRAINING APPROACH

1. **Repetition of July 2001 EDS Spectra Characteristic Study for Libby-Type Amphiboles**

Each laboratory will need to demonstrate an understanding of the definition of a Libby-type amphibole (LA) and an ability to recognize LAs. This will be accomplished by repeating the EDS Spectra Characterization Study, which was performed in July 2001 by Reservoirs Environmental Services, Inc. (RESI) and EMSL Analytical, Inc. (EMSL). The laboratory will need to perform all study analysis prior to being visited by a Lab Mentor (see Training Approach 2 below). The lab mentor (while on-site) will review the Laboratory's plotted EDS results to insure that they are consistent with the findings of July 2001. Following the mentor's review, the mentor will provide a recommendation regarding the laboratory's understanding and whether there are any reasons for the laboratory to repeat the study (partial or complete).

2. Lab Mentoring Program

Senior personnel from RESI and EMSL that have been involved with providing analytical support on the Libby Asbestos project (for at least one year) will act as "Mentors" to new laboratories, as requested. These lab mentors will travel to the new laboratory and will work with the laboratory's personnel to address the issues as listed above under "Training Issues of Concern". The mentors will follow a training checklist, which will be prepared by RESI in collaboration with Volpe, CDM, EMSL, and EPA. Upon completion of the mentor's visit the mentor will document their review with a brief one-page summary and their recommendation as to whether the laboratory is ready to start accepting project samples or whether additional follow-up training is required. The mentor's review summary will become part of CDM's contract file.

3. Re-analysis of Project Samples

While the lab mentors are on-site they will observe laboratory personnel as they prep and analyze previously analyzed project samples for each method being used in support of the project. In the case of the ISO 10312 method, the laboratory shall prepare samples via both direct and indirect preps. The mentor will verify the use of and instruct the laboratory on project specific variances to insure consistency. In addition, in the mentor's presence, the laboratory will perform an ISO recount same of three previously analyzed project grids (which contained fibers).

OTHER

1. Provide for informational purposes and reference copies of all QAPPs and SAPs.
2. Laboratory will participate in all scheduled weekly laboratory telecons.
3. Participation in Round Robin PE Study and/or other periodic blind QA/QC samples.